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OCTOBER 1982
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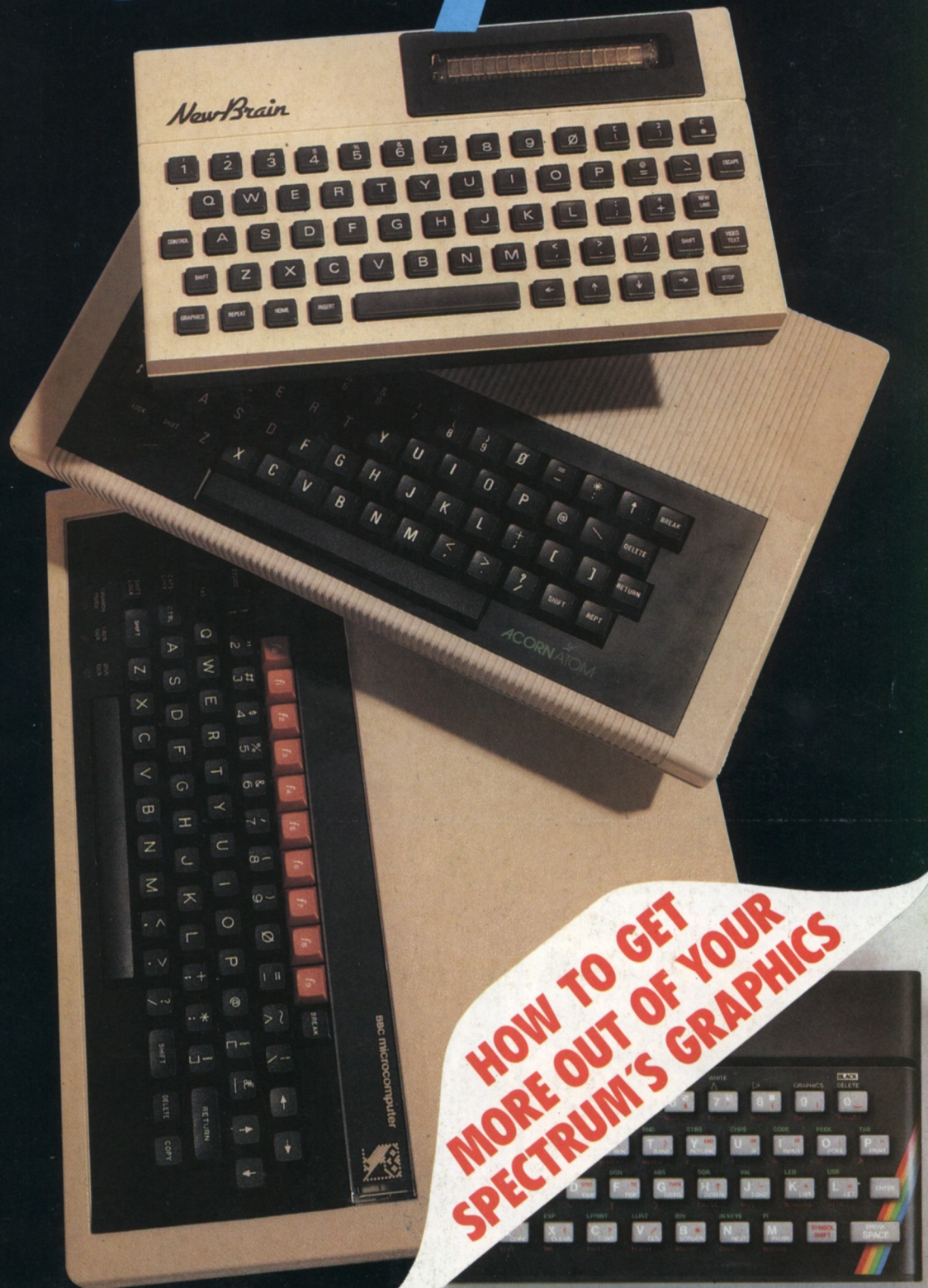
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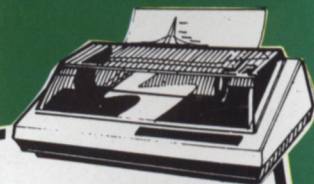


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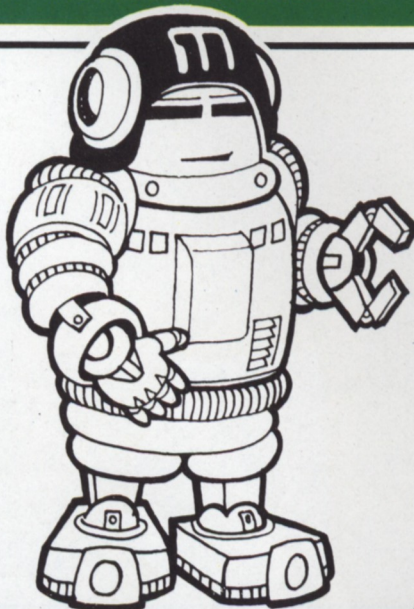
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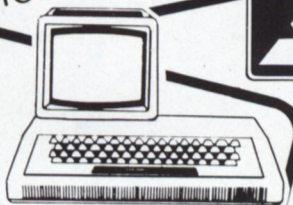
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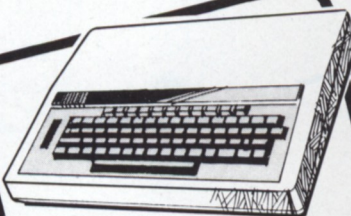
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The battle for the cheapest micro computer on sale began two months ago with consumer electronics firm Binatone's announcement of a £50 computer, but where will it all end?

Binatone's forthcoming micro computer sounds an extremely sophisticated little machine with features including a typewriter style keyboard, colour graphics and sound effects. The basic machine will come with 16K RAM on board selling for £49.95. It can be expanded to 64K RAM but the price for that add-on is as yet unknown. The specification for Binatone's baby includes the facility to use software written for a Tandy TRS-80 computer with the machine, as well as that of another so far un-named supplier. An interesting idea which can be developed.

Now the veteran pioneer of personal computing, Clive Sinclair, is making a bid to be the first manufacturer on the market with an under £50 computer. Through an associate firm he is reducing the cost of ZX81s to the golden price of £49.95.

The motives behind these two firms are similar. Both want to capitalise on the current personal computer boom — and who can blame them? That is Binatone's prime reason for the new computer. That's all very well, but what of the quality of the product? Binatone is not established in the computer manufacturing field. Its product range consists of a variety of consumer electronics, and includes a first generation, which means basic, television games centre. Last year Binatone had no plans to continue software support for the machine.

There is also nothing innovative in the computer it has announced. Computer technology has now reached the stage where it can be easily used to design a computer around, as long as the basic microprocessor is a good, tried and tested one providing standard functional facilities.

This is good news for the buying public because it boosts the competitive edge of the market, but does little for advancements in computing. The recently launched Dragon 32 is an example of this practice. There is nothing new in the workings of the computer, but it has just about anything a beginner or home user would want in a computer for a low price, £200.

Sinclair's motive is less obvious. Sinclair Research is an established name in the personal computing field and he wants to keep it that way. By letting another, unknown, firm launch the first micro under £50 he risks losing a stronghold, if only in reputation, on the market.

Whoever gets there first it will be interesting to watch the winner's progress and see whether other manufacturers will knock down prices of their own computers.

Turn over
the page for a full
contents list of this issue.



NEWS

Newstalk 8
Refresh your memory cells with the latest goings on in the computer world.

NEXT MONTH

Next Month 12
Find out what awaits you in next month's Personal Computing Today.

LETTERS

Your Letters 14

PET

SOFTWARE

Solgor 16
Could anything be more frustrating than Rubik's cube? Try Solgor and find out just how infuriating a row of numbers can be.

COMPUTER CLUBS

Clubhouse 21
This month we cast a watchful eye on the Crawley Computer Club and find out what trouble is brewing as they meet in their local.

NASCOM

SOFTWARE

Bouncing Beastie 23
Where does it come from? What does it want? How did it get into your computer? All these questions will be answered as you come face to face with the dreaded Bouncing Beastie.

SPECTRUM

User Defined Graphics 27
This article not only gives you an insight into how user defined graphics work, but also allows your Spectrum to give birth to its very own invader.

DEALERS

Look Before You Leap 30
In the second of our regular series we look at the Tandy Computer Centres and find out what they can do for prospective Tandy buyers.

ZX-81

TECHNIQUE

ZX Memory Saving 34
Stretch 1K to the limits using these techniques on your ZX81.

REVIEW

Software Reviews 38
Once more our review team has spent hours just playing games and now they tell you if they are any good.

ATOM

SOFTWARE

Little Black Book 42
Despite its slightly dubious title this program is in fact a very useful utility. Honest.





TI/99 4A

SOFTWARE

Blind Maze 49
Get lost ... deep in the heart of Texas. You too can blunder around for hours in the depths of your computer wandering in the labyrinths of this maze.

REVIEW

Using Atom with BBC BASIC 54
How does your Atom match up to the BBC computer when you give it the BBC BASIC board. In our lead feature we find out whether the Atom becomes a nephew to auntie beeb.



LETTERS

Micro Answers 62
This month we delve deep into our mailbag and attempt to sort out where people have PEEKed instead of POKed.

PROGRAMMING

TECHNIQUE

Gamesboard 66
This month in gamesboard we look at the ins and outs of transferring the infamous game of Roulette onto your TV screens.

REVIEW

NewBrain 70
Is the NewBrain a home computer or a business computer. Find out in our review.



TRS 80

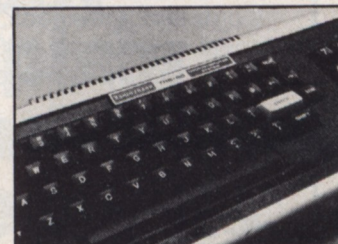
MICROSPOT

Random Numbers 74
Try out this useful routine in programming your games.

BBC

SOFTWARE

Wordprocessing on the BBC 77
If you want to drop us a line, why not use your BBC computer and do so with this program?



TRS 80

SOFTWARE

Asteroid War 82
Dodging meteors, zapping aliens and winning through. All on a Tandy.

REFERENCE

Factfile 87
Get the low-down on which machines are available, what you can add to them and how much it will cost you.

REFERENCE

Software Checklist 97
After some software for your machine? Consult our checklist and find out what's available.



REFERENCE

Micro Terms 110
Keep your head above water in the sea of computer jargon and read our dictionary.



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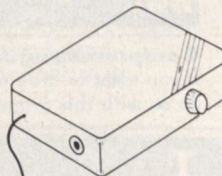
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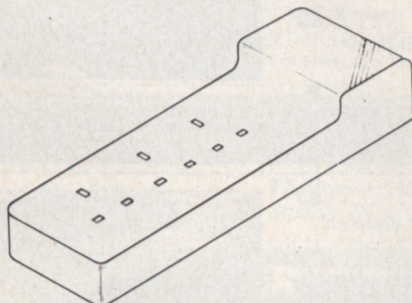
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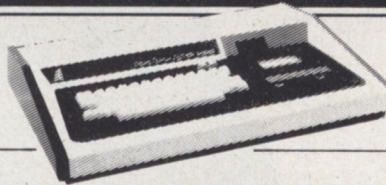
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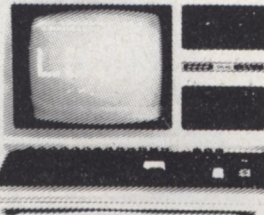


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Clive Beats Binatone to First £50 Computer

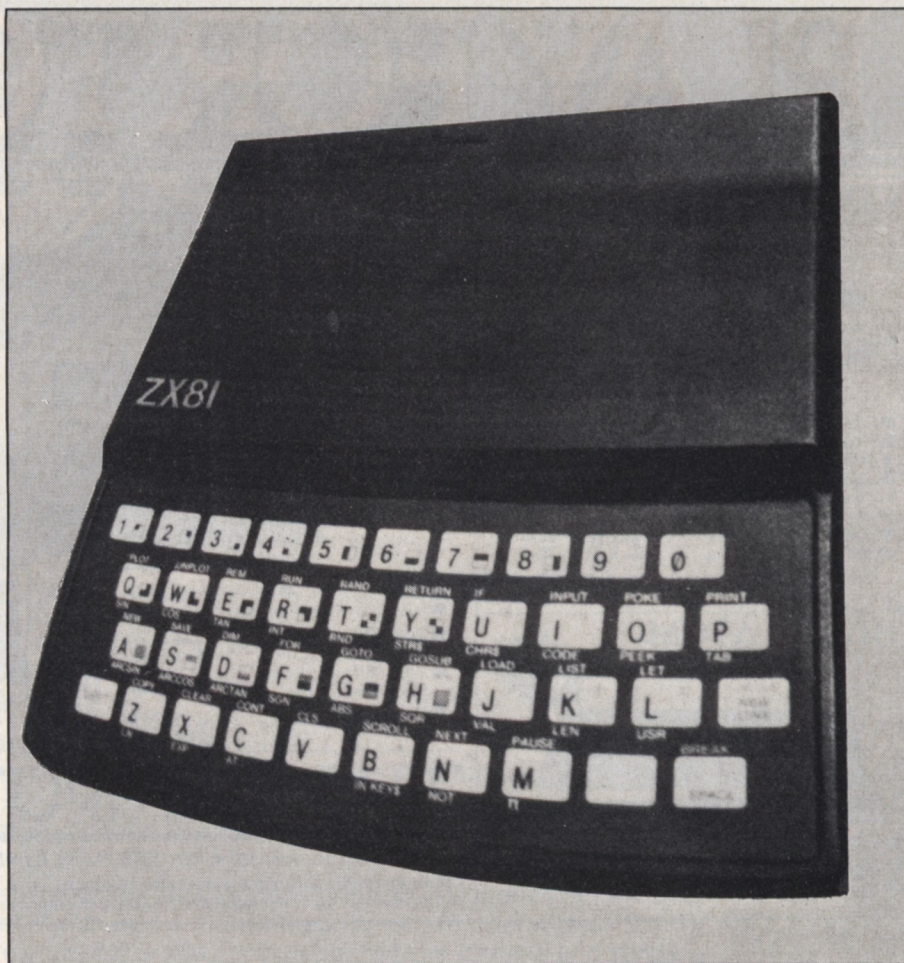
Sinclair Research has pipped Binatone to the post in bringing out the first micro computer under £50.

Although he is not setting the world alight with another brand new computer Clive Sinclair has knocked down the price of his top-selling micro computer, the ZX81, to £49.95 from £69.95 including VAT. The new prices took effect from August 9.

In the same swift move he has also changed his marketing plans to make the ZX81 more widely available. From that date the ZX81 was on sale through a number of high street retail outlets including Greens, the electrical shop located in most Debenhams stores, as well as Boots the chemists. All existing peripherals available for the machine are now on sale there too.

Clive Sinclair summed up his reasons for this change: 'The personal computer is no longer the preserve of the hobbyist, but is becoming as much a household item as a television or hi-fi'.

Also pulled in to aid Sinclair in this attack is a new distribution company called Prism Microproducts. It is responsible for supplying high street stores who have less than 20 outlets, with the ZX81 and its peripherals. So, if



you have a computer orientated shop and fancy stocking the ZX81 contact Bob Denton, Prism

Microproducts, 30/31 Islington Green, London N1, or phone him on 01-359-7481.

Hollywood's Video Star

Now video games are so popular that even Walt Disney Productions has been hard at work producing a film revolving around spectacular computer graphics.

The film, called TRON, is the first of its kind. Making extensive use of computer generated graphics and imagery, the film's producers have created a fantasy world inside a computer, where programs are the alter egos of their creators and video games are played out in real life.

The plot revolves around the exploits of Kevin Flynn, who after leaving his job as a programmer for an American multi-national firm and becoming a video game expert, gets called back by two of his colleagues so that he can help them recover their programs from the control of the tyrannical MCP (Master Control Program).

In doing this Flynn gets transported very cleverly to the electronic world inside the computer where he proceeds to do battle with all and sundry in an

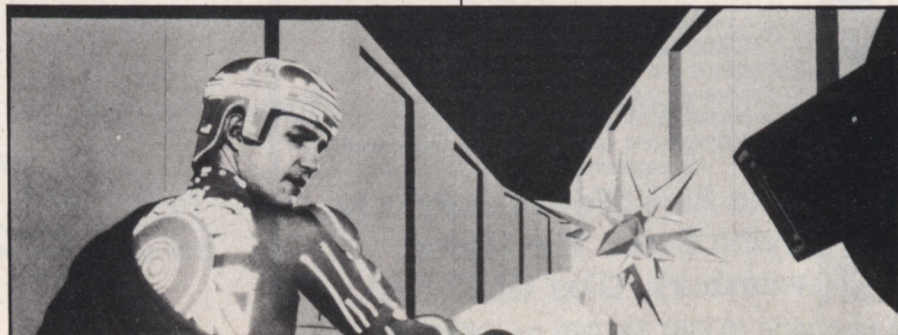
effort to wrest control of the computer from the MCP.

Along his journey through this futuristic landscape he meets and is helped by Tron, a radical program that was written to destroy the MCP, Yori, who is a program written by Flynn's ex-girlfriend to simulate her laser experiments and Ram, an actuarial program who he meets in one of the video games. Together they fight, trick and zap their way to the MCP, in scenes of pure visual delight, for the final showdown.

Tron is fast action all the way through and should appeal to all ages, the graphics themselves are

an experience all of their own. But you will have to wait until September to see it. It also contains a few 'in-jokes' that computer people will appreciate. One of the best is when Flynn meets a small energy pulse called Bit, who can only answer his questions yes or no.

All told the film is a superb piece of highly entertaining fantasy and the thought of all the work that must have gone into programming the computer graphics makes me want to hang up my light pen, burn my BBC Micro and take up something easy like sheep farming.



Computer Music At A Price

What has a nightingale and a smashing plate got in common? The answer is that you can use both of them to play tunes on the Fairlight CMI.

This is the ultimate marriage between computer and synthesiser technology. It even looks as if it might be equally at home on a businessman's desk or centre stage at Madison Square Gardens.

The Fairlight CMI, which stands for Computer Musical Instrument, can be programmed in one of two ways. First, you can play a sound into it via a microphone which the computer will then analyse digitally and transpose it onto its six octave keyboard. For an example of this listen to the plate smashing sequence in singer Kate Bush's hit single Babooshka.

Once the sound is in the Fairlight you can modify it or

combine it with other sounds using the light pen or the alpha-numeric keyboard that come with the system. The second way to program the machine is to directly draw a wave shape onto the VDU and then use the machine's editing facilities to alter or add to it.

What this all adds up to is a synthesiser that creates any sound you dream up, or mimic any natural sound you play to it. The actual quality of the sounds which come out the other end are staggering. It is very hard to tell the difference between the original sound source and the Fairlight produced sound.

If you fancy having a complete orchestra in your living room, or want to record your household pets and play your way onto Top of the Pops, then all you need is the Fairlight CMI, a little time and a cool £18,000. One day it might be available at a sensible price. Not surprisingly only 26 have so far been sold.

Bumper Books

Following hot on the heels of the Getting Acquainted series of books computer author Tim Hartnell has another two under his belt.

The first is aimed at beginners who have joined the BBC Computer army and is titled 'Let Your BBC Micro Teach You to Program'. It is designed to take the reader from first principals of computing up to the more advanced features of the computer, including a chapter on mastering the graphics. The cost is £6.45 and it is available directly from the publishers Interface.

'Programming Your ZX Spectrum', will enlighten that computer's owners in many areas. The book offers a graded course in all aspects of Spectrum programming and contains over 100 routines and programs that are all guaranteed to run. It costs £6.95 and it too is available from Interface.

Sinclair Plugs Into Prestel

Bubbling up from the depths of Sinclair Research is another new development. It concerns the use of telesoftware as a method for distributing programs and information more cheaply and conveniently.

The idea revolves around using Prestel or a similar system like a catalogue into which you can plug your computer and 'download' programs that you want. That means you can put programs into your micro from another computer system. Sinclair sees cassettes and floppy discs as an outdated medium that is commonly subject to piracy and plagued with distribution and sales problems. The firm sees the future of personal computing relying on communication and hope that by providing cheap interfaces, modems and telesoftware facilities, they can allow the computer user to communicate and exchange information with various sources around the country.

The telesoftware concept will enable you at home to connect your computer, via a telephone, to the Prestel computer and use it as if it were a proper Prestel adapter. Set up on Prestel will be computer pages containing lists of software titles. If a user wishes to run one of these programs all he has to do is tell the computer to send him the program.

The Prestel computer then sends the program down the telephone line and the computer at the other end loads it as if it were loading from either tape or disc. The user's Prestel account is then debited for the cost of the program and for the time spent using the system.

Once in the user's computer it can then be saved onto tape in the usual fashion. Also possible with this system is a software library. This will allow a user to 'download' a program into his machine, but not save it on tape or disc. The cost will be a lot cheaper than buying the program outright, as you only pay for the number of times you use it.

Hopefully, as well as giving greater power to the computer user, this system will provide a useful boost to the ailing Prestel scheme. Times and prices have yet to be announced, but as soon as they are you will read them here.

The Last Word . . .

Rounding up the news for this month are three new products that you can add to your computers. Starting off is the Peripheral Expansion System for the Texas TI 99/4A computer. This unit will allow you to plug up to seven peripherals into the single unit. It will hold memory expansions, interface cards and a single 5 1/4" disc drive, along with other plug in cards. For further information and

prices contact your local Texas Instruments dealer.

ZX81 owners frantic for a new keyboard can turn to the Economic ZX81 keyboard. This keyboard fits on top of your original ZX keyboard and gives you a more positive feel to all of the keys. The key tops have been redesigned and repainted, using a total of seven different colours. Included with the keyboard is a separate function sheet, which can be fixed to the top of the ZX81 case. The cost is £11.95 inclusive, and details can be obtained from David Heartford, 91 High Street, Evesham, Worcestershire WR11 4DT.

Finally, Audiogenic has announced a new cartridge for the VIC-20 which professes to turn it into a full wordprocessor. The cartridge which contains the program and an extra 8K of memory retails for £125 including VAT. The program is based on the widely used, tried and tested, Wordcraft package and is called, not surprisingly, Wordcraft 20.

It embraces all the usual wordprocessing functions such as, scrolling screen, delete, insert, move and all the output functions. Documents can be output to either the VIC printer or any parallel or RS232 serial printers. Audiogenic can be contacted at

P.O. Box 88,
Reading Berkshire
or telephone
(0734) 595647.

Don't let its size fool you.
If anything NewBrain is like the Tardis.

It may look small on the outside, but inside there's an awful lot going on.

It's got the kind of features you'd expect from one of the really big business micros, but at a price of under £200 excluding VAT it won't give you any sleepless nights.

However, let the facts speak for themselves.

You get what you don't pay for.

NewBrain comes with 24K ROM and 32K RAM, most competitors expect you to make do with 16K RAM.

What's more you can expand all the way up to 2 Mbytes, a figure that wouldn't look out of place on a machine costing ten times as much.

We've also given you the choice of 256, 320, 512 and 640 x 250 screen resolution, whereas most only offer a maximum of 256 x 192.

Big enough for your business.

Although NewBrain is as easy as ABC to use (and child's-play to learn to use) this doesn't mean it's a toy.

Far from it.

It comes with ENHANCED ANSI BASIC, which should give you plenty to get your teeth into.

And it'll also take CP/M® so it speaks the same language as all the big business micros, and feels perfectly at home with their software.

NO OTHER MICRO HAS THIS MUCH POWER IN THIS MUCH SIZE FOR THIS MUCH MONEY.



So as a business machine it really comes into its own.

The video allows 40 or 80 characters per line with 25 or 30 lines per page, giving a very professional 2000 or 2400 characters display in all on TV and/or monitor. And the keyboard is full-sized so even if you're all fingers and thumbs you'll still be able to get to grips with NewBrain's excellent editing capabilities.

When it comes to business graphics, things couldn't be easier. With software capabilities that can handle graphs, charts and computer drawings you'll soon be up to things that used to be strictly for the big league.

Answers a growing need.

Although NewBrain, with its optional onboard display, is a truly portable micro, that doesn't stop it becoming the basis of a very powerful system.

The Store Expansion Modules come in packages containing 64K, 128K, 256K or 512K of RAM. So, hook up four of the 512K modules to your machine and you've got 2 Mbytes to play with. Another feature that'll come as a surprise are the two onboard V24 interfaces.

With the aid of the multiple V24 module this allows you to run up to 32 machines at once, all on the same peripherals, saving you a fortune on extras.

The range of peripherals on offer include dot matrix and daisy wheel printers, 9", 12" and 24" monitors plus 5¼" floppy disk drives (100 Kbytes and 1 Mbyte) and 5¼" Winchester drive (6-18 Mbytes).

As we said, this isn't a toy.

It doesn't stop here.

Here are a couple of extras that deserve a special mention.

The first, the Battery Module, means you won't be tied to a 13 amp socket. And, even more importantly, it means you don't have to worry about mains fluctuations wreaking havoc with your programs.

The ROM buffer module gives you a freedom of another sort.

Freedom to expand in a big way. It gives you additional ROM slots, for system software upgrades such as the Z80 Assembler and COMAL, 2 additional V24 ports, analogue ports and parallel ports.

From now on the sky's the limit.

Software that's hard to beat.

A lot of features you'd expect to find on software are actually built into NewBrain so you don't need to worry about screen editing, maths, BASIC and graphics.

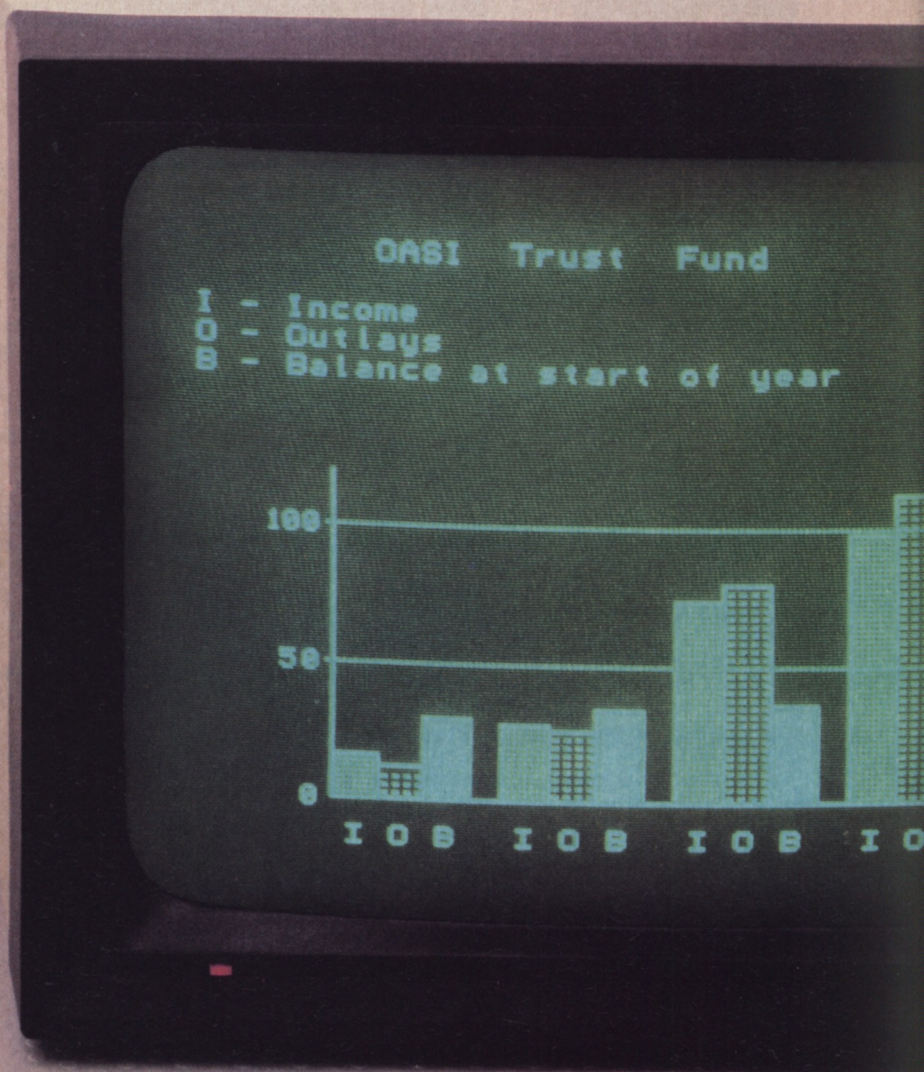
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Personal Computing Today

Submitting Programs to Personal Computing Today

Have you written a program or article and would like to tell the world about it? Everyone likes to have a go at programming and we would love to look at your programming works of art to consider them for publication.

Remember we can only print what you want to read by knowing what you like. So the more you send us the better. We want to cover as many sorts of programs as possible too so whether yours is a game or a useful programming routine or aid don't hesitate to send it to us. We pay a standard fee for any programs published, if you need any incentive.

If you would like to submit a program for publication send it to: The Editor, Personal Computing Today, 145 Charing Cross Road, London WC1.

So that you know how we like to submit programs for use in the magazine printed below are guidelines which we would like you to follow.

What To Do

There are two kinds of program feature carried within our pages. The first is the brief "Micro-Spot": A page in total containing a brief description of the software, notes on its usage and a full listing.

These are designed to be short and to the point and are not primarily intended for the beginner in programming. Thus the explanation does not have to be totally explicit.

The second method of presentation is that of a full article. This can run anywhere in length from two pages to five pages and is formatted to a rigid style of presentation.

Because PCT is aimed at the newcomer to computing, our main software has to be well documented and explained. We have decided upon the following method of publishing programs and would ask authors to submit material in this form whenever possible.

1. The article is broken into four parts.
 - (a) Introductory Text
 - (b) Program Listing
 - (c) How It Runs
 - (d) Hints on Conversion

2. The Introductory Text should contain an explanation of what the program is designed to do, what is to be expected on-screen when it is run, any problems the author overcame in producing the program and any background necessary to enable our readers to use the listing. For example, if it is a game program, state the rules of the game, win condition, 'good score' level etc., etc.

3. Programs should preferably be run out on a printer straight from the computer. In this way less errors creep in. Otherwise typed or handwritten is acceptable but must be double-spaced and **DOUBLE CHECKED!**

4. How it Runs should be as near to a line-by-line, or block-by-block description of the program as is possible. In this way people can learn more easily how to produce programs of their own to your standards.

5. Each computer on the market has its own little foibles and oddities. No one knows those of your machine better than you. How would someone wishing to adapt your program go about untangling them? What special use have you made of your computer's special abilities? Graphics?

Always include a full list of variables, too.

NEXT MONTH Spectrum/VIC 20 Graphics

To most people graphics are a very important function of their computer but high resolution facilities tend to make the inexperienced have a brain storm.

In an effort to overcome the difficulties people come across when programming in high-resolution mode next month we take the Spectrum and VIC 20 aside and compare the facilities of the two. Find out what the two computers have to offer graphically speaking. We will tell you what you can do with the facilities they offer, and compare just how easy, or difficult, both machines' graphics are to use. We'll help you solve your shape-making problems.

Micro Buying - Get it Right

Many people are on the brink of taking the plunge and entering the tide of computer owners but the wealth of machines now available at a reasonable price is bewildering and daunting. Personal Computing Today has come up with what we believe, from our readers viewpoint, is the 'ideal' personal computer.

We will make sure you get it right the first time round when you join the computer army. By taking our advice we hope you will make the right decision when micro buying. Pick up on the points we make to guide you in the right direction and watch out for the pitfalls.

TRS-80 Tipster

TRS-80 owners, whether recent or old timers, can make the most of our programming feature giving hints and tips. Iron out some of those old problems and discover how to improve your programs.

Space gamester addicts can wait with baited breath for an exciting TRS-80/Video Genie game, Saturn Attack. Collect valuable mineraloids from Saturn's surface but watch out for the deadly space sweepers planted by the enemy Titans which can destroy your probe. Can you and your computer survive the sweeping onslaught? Find out next month.

Piles of Programs

A useful program for VIC-20 owners who have experienced problems with their function keys. This short, sharp listing will fill you in on a neglected part of Commodore's baby. It enables you to assign a separate function up to eight characters long to each of the eight keys.

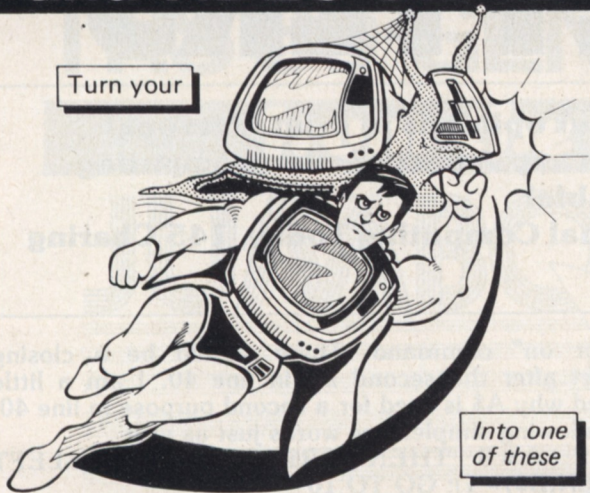
November brings autumn and bad weather but PCT will brighten up your days with a special analyses of teletext display on the BBC Microcomputer. This stands up where the BBC manual falls down and tells you how to make the most of your machine's high resolution graphics and use the functions supplied for teletext.

Our regular games programming series focuses on an ancient, traditional board game Ayo which is a version of one of the oldest known games called Mancala. It can be as simple as noughts and crosses or as tactically difficult as chess. It involves occupying and capturing your opponent's territory which consists of rows of cups. Sounds intriguing? Read November's PCT to find out more.

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YOUR LETTERS

This page is where you get the chance to put your opinions in print. Personal Computing Today welcomes letters from you on any aspect of microcomputing and views in general – as long as they're printable!

Please drop us a line to: The Editor, Personal Computing Today, 145 Charing Cross Road, London, WC2H 0EE.

Dear PCT

I have had a ZX81 for 6 months. But since I bought it I've had nothing but problems with it, and they are getting worse. At first my programs crashed when I was entering them. Then two months ago I received a 16K RAM pack. Due to the fault I am only able to get 5.4K out of the RAM. It is not the RAM because I have checked it on other ZX81s. Sometimes when typing in a program the cursor stops dead and the only solution is to pull out the plug. Also when loading machine code the computer will change the hex code into a character which isn't the right one.

E.G. Hex code Character
C5 CLEAR

I have written to Sinclair in case it is a faulty ROM but I've had no reply and I sent the letter three weeks ago. Do you have any ideas on what the problem is? If so, how can I fix it?

K Driscoll
Merseyside

Editor's reply: Unfortunately it does sound like your machine has a bad ROM in it somewhere which means that you will just have to keep plugging away at Sinclair to remedy it.

Dear PCT

Congratulations on the introduction of a superb new computing magazine. Your method of software review is clear, concise and amusing.

As this will be a regular feature I would be interested, as would I'm sure, many other readers, on war games software. In particular, I was interested in one called "Conqueror" marketed by Algray for the 16K PET.

A review of this game would help me decide on a purchase.

D R Wilson
Humberside

Editor's reply: In future issues we will try and include as wide a variety of games and computers as possible. So keep your eyes peeled for a war game review.

Dear PCT

Having written a text program of my own I was interested in S A Barnett's program in your August 1982 issue.

It is not quite true to say you cannot input a line containing a comma. You can if you put the entry inside quotation marks. In fact, you need only type in the opening quotes. It is, however, a nuisance to have to remember to include the quotes and I have therefore used substantially the same method as S A Barnett.

There seem to be two mistakes in his program. Line 5 should be PRINT CHR\$ (14) which is the TRS-80

"cursor on" command. There should be a closing bracket after the second B\$ in line 40. I am a little puzzled why A\$ is used for a second purpose in line 40. The following simpler line works just as well
40 IF A=8 THEN PRINT A\$; B\$=LEFT (B\$,LEN(B\$)-1): GO TO 10

I am looking out for the next issue of the magazine with interest.

Peter Davy
Wakefield

Dear PCT

First, may I congratulate you on the first edition of your magazine, it proved both interesting and useful.

I am an owner of a ZX81 and intend to purchase a BBC Micro when finances permit.

I would be pleased if you could answer some queries of mine.

1. Will a ZX user quickly adapt to the BBC BASIC?
2. Do the cassette and TV cables come complete with the machine?
3. Are the LOAD and SAVE commands reliable even with a domestic recorder?
4. Does the manual give details on the machines assembler?
5. Is it true that on the Model B machine only 4 colours are available on the screen at the same time?

A Stead
Hull

Editor's reply: Once you have learned one version of BASIC it is very easy to change to another. One thing that might take some getting used to when you get your BBC machine is that you have to type the keywords in as opposed to putting them in with a single keystroke.

The BBC machine does come complete with cassette and TV cables, but you do have to fit plugs on the end of the cassette cable for your particular tape machine.

The BBC machine offers you two tape operations, one which loads and saves at 300 baud, and one which uses 1200 baud. If you have a reasonable quality tape recorder then both of these are reliable. However, if you are trying to load a 1200 baud tape from someone else's machine you might encounter some problems.

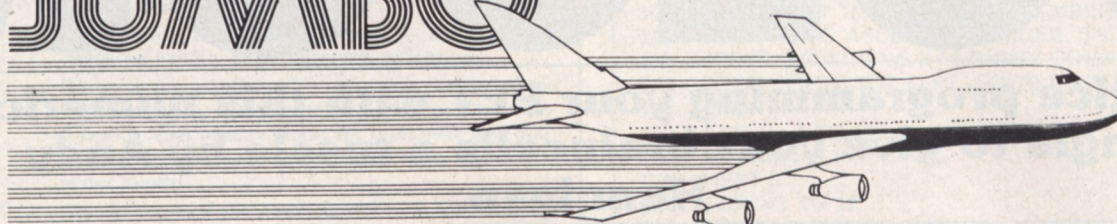
The machine's manual does give some basic information about the machine's assembler capacity but there will be another manual available shortly to deal purely with this.

In some modes the Model B will support up to 16 colours, notably Mode 7 and Mode 2.

INNOVATIVE TRS 80-GENIE SOFTWARE

from the professionals

JUMBO



Fantastic new flying simulation

Occasionally a program comes along of such magnitude that it is hard to describe it, especially within the space allowable in an advertisement. Jumbo is such a program. There have, of course, been flying simulation programs before, but they have all rather fallen into the trap of trying to produce a graphic representation of the ground at some stage or other in the program, thus taking up space, and/or they have concentrated on the single act of flying. In other words, although one gets the feeling of flying a small aircraft, one is not going anywhere.

Jumbo is a fantastically accurate simulation of flying a Boeing 747. These planes are not small, and are not flown by eye. They are flown by eyes and instruments, and the instrument graphics in this simulation are really first class. As you may know, the primary instrument of an aircraft is the artificial horizon. This is simulated very well, and includes instrument landing approach indicators. Graphic maps of very high quality are produced and it is possible to fly in all of the British Isles including Southern Ireland, and to New York on the Eastern U.S. seaboard. The actual airports are at London, Birmingham, Manchester, Prestwick, Edinburgh, Belfast, Shannon and New York.

The program was written by two authors who combined their joint skills to produce a unique piece of software. The programmer got the last byte of performance out of the machine and the pilot the last drop of authenticity out of the simulation. Other simulation programs produce at best a similarity towards flying. With Jumbo you really feel that you are behind the controls.

The authors have used a number of gimmicks and programming techniques. For instance, it is possible to switch on an automatic pilot and to jump forward in time in increments of one minute or one hour — otherwise of course a flight from London to New York or vice versa would take some 8 hours to simulate. Whilst in this time skip the various controls are left as they are but fuel consumption and distance to go are taken forward at their correct rate.

A chart is supplied containing various items of data which you will need, including the take-off data for a 747 with various take-off weights, flap retractions, climb and cruise speeds and descent distances.

Realising that not everybody can fly a 747 and that there is even a large proportion of the population that cannot fly anything, two important items of assistance have been added. First of all is the documentation. This is split into two parts. The second is a "manual" on flying the 747. In other words, the instructions for running the program. The first part, however, is what amounts to an instruction manual for flying. It assumes that the user knows nothing about aircraft and although we do not purport that it gets anybody up to any sort of standard after it has been assimilated, the reader should have sufficient knowledge of flying and the theory of flight to fly in the program itself. The second feature of assistance to the novice pilot is a feature in the program which enables the user to practice landings. When the program is started, if one presses the P key, the aircraft is automatically put 11 miles out from London Airport approaching on an instrument landing.

The controls are pretty well complete, even to dive and wheel brakes. The flying track may be continuously monitored on the map display. Bearing and distance to your intended point of landing are available all the time. The instruments, incidentally, consist of:

Artificial horizon
Aileron indicators
Indicated airspeed
Power setting
Elevators

Attitude
Compass
Turn indicator
Flap indicator
Altimeter

Fuel
Elapsed time
Distance to landing
Rate of climb

Six maps may be chosen, as follows:

Scotland, Northern England, Southern England, Ireland, Eastern U.S.A., The whole of the U.K.

Route information and present position are shown on the map displayed. It is very difficult to think of any factor that the authors have overlooked. Even the quite meaningful thinning of the air with increasing height, which greatly affects the airspeed indicator in real life, is taken into consideration. Rather than having a fixed stalling speed, this continuously changes with the flight configuration, the weight, height and power setting, again as it does in real life.

We like to think that we publish good programs. Jumbo is outstanding. It is available on tape or disk for 16K or 32K memory machines. It is compatible with the Model I and Model III Tandy, Video Genie, Genie I and Genie II machines.

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SOLGOR

Practice programming your PET with this numerical tangle to give your braincells a tussle by Andy Hennigan.



Solgor is a simple number game that is quite easy to program but requires a bit of thought to play. At the beginning of the game you are presented with the numbers 0 to 9 all shuffled up like this:

3 5 6 4 2 7 9 0 8 1

All you have to do is sort them into ascending order, 0 to 9, 'smallest on the left, greatest on the right' — hence the name. The catch is that you are only allowed to reverse the order of 2 to 10 digits counting from the left with each move. For example, if you decide to reverse the first three digits in the string of numbers above the result will be:

6 5 3 4 2 7 9 0 8 1

The game finishes when the numbers are in 'Solgor' order and you judge your performance by counting the number of moves it took.

The sample run shows one way of solving the arrangement given at the beginning. The easiest way to attack the problem is to join up neighbouring numbers without breaking up existing runs.

It is important to think ahead so that you can re-unite two numbers with almost every move. In the example only two moves (8 and 10) do not actually place any numbers in their correct sequential position.

If you get bored with the game you could make it more difficult by using the 26 letters of the alphabet instead. Another suggestion is to provide it with a store of words to shuffle so that your first problem is to spot the anagram, and then sort it out using the Solgor rules.

For the deep thinkers a very interesting exercise is to devise an algorithm to play the game — not as easy as it sounds.

HOW IT RUNS

Line By Line Description

- 150-220 Places the digits 0-9 randomly in the array. The array is first filled with "-1"s so that placing the loop can recognise vacant places.
- 250-300 Prints out the numbers and the input prompt "reverse?". The player decides at this point how many to move.
- 320-340 Rejects fractions and numbers less than two or greater than ten.
- 350 The "number of goes" is increased — after the check on validity in the interests of fairness.
- 370-400 Reverses the numbers. Try executing two and three digit reverse by hand on paper if you can't see how it works. This routine works for both even and odd moves because the middle number in an odd reverse is not moved.
- 420-430 Checks to see if the numbers are in Solgor order. If they are the game's over.
- 450-510 Success at last! Prints an evaluation of you skill — or lack of it. The criticism is perhaps a little harsh.
- 530-550 Offers the player another game.

>RUN

**** SOLGOR !! ****

All you have to do is sort out the string of numbers into ascending order, 0-9, by reversing 2-10 digits counting from the left. Good luck!

3 5 6 4 2 7 9 0 8 1

reverse ? 4

4 6 5 3 2 7 9 0 8 1

reverse ? 3

5 6 4 3 2 7 9 0 8 1

reverse ? 2

6 5 4 3 2 7 9 0 8 1

reverse ? 5

2 3 4 5 6 7 9 0 8 1

reverse ? 9

8 0 9 7 6 5 4 3 2 1

reverse ? 3

9 0 8 7 6 5 4 3 2 1

reverse ? 2

0 9 8 7 6 5 4 3 2 1

reverse ? 10

1 2 3 4 5 6 7 8 9 0

reverse ? 9

9 8 7 6 5 4 3 2 1 0

reverse? 10

SOLGOR !!!!!!!

It took you 10 moves which is not so good.

Another game (Y/N) ? N

PROGRAM LISTING

```

10 REM ## SOLGOR. BP ##
20 REM ## THE NUMBER SORT GAME ##
30 REM ## ANDY J. HENNIGAN 1981 ##
40 REM
50 DIM N(10)
60 PRINT
70 PRINT"** SOLGOR !! **"
80 PRINT
90 PRINT "ALL YOU HAVE TO DO IS SORT"
100 PRINT "OUT THE STRING OF NUMBERS"
110 PRINT "INTO ASCENDING ORDER, 0-9, BY"
120 PRINT "REVERSING 2-10 DIGITS COUNTING"
130 PRINT "FROM THE LEFT. GOOD LUCK !"
140 PRINT
150 FOR I=1 TO 10
160 LET N(I) = -1
170 NEXT I
180 FOR I=1 TO 10
190 LET X=INT(RND(1)*10+1)
200 IF N(X)>-1 THEN 190
210 LET N(X)=I-1
220 NEXT I
230 LET G=0
240 PRINT
250 FOR I=1 TO 10
260 PRINTN(I);
270 NEXT I
280 PRINT
290 PRINT
300 INPUT"REVERSE";R
310 PRINT
320 IFR<=10 AND R>1 AND R=INT(R) THEN 350
330 PRINT"NO GOOD, PLEASE TRY AGAIN"
340 GOTO 300
350 LET G=G+1
360 FOR I=1 TO I/(R/2)
370 LET P=N(I)
380 LET N(I)=N(R-I+1)
390 LET N(R-I+1)=P
400 NEXT I
410 FOR I=1 TO 10
420 IF N(I)<>I-1 THEN 240
430 NEXT I
440 PRINT
450 PRINT"SOLGOR !!!!!!!"
460 PRINT
470 PRINT"IT TOOK YOU";G;"MOVES WHICH"
480 IF G<5 THEN PRINT "MEANS YOU PROBABLY CHEATED."
490 IF G<10 AND G>=5 THEN PRINT"MEANS YOU ARE PRETTY GOOD."
500 IF G>=10 AND G<20 THEN PRINT "IS NOT SO GOOD."
510 IF G>=20 THEN PRINT "IS TERRIBLE."
520 PRINT
530 INPUT "ANOTHER GAME ? (Y/N) ";Q$
540 PRINT
550 IF Q$="Y" THEN 60
560 END

```



SOLGOR

HINTS ON CONVERSION

The Solgor program is written in Zilog BASIC 3.0, which is fast rather than fancy, and no special or peculiar features are used so you will have no problem running it in other dialects. The following points will help clear up any doubts.

- Arrays, strings and dimensioning N(10) is a ten element numerical array; Q\$(1) is a one character string. Array elements are numbered from 1.

- RANDOMIZE, RND

RANDOMIZE reseeds the pseudo-random number generator; RND supplies the next number in sequence. Many versions of BASIC use RND(X) for both of these.

- INT(X)

An intrinsic function that returns the integer part of X. Eg., INT(3.8) is 3.

- "&"

The ampersand symbol "&" is a logical AND in IF...THEN statements. The word "AND" is often used instead.

- <> "not equals" (often =).

- <= "less than or equals".

- >= "greater than or equals".

The digits to be sorted are held in the array N(10), G is the number of goes you've had and R is the number of digits you want to reverse.

The program has been converted from zilog BASIC to MICROSOFT BASIC, so it is already in a standard form. The points to pay attention to when converting are firstly, the random number generation in line 190, as this is achieved in different ways on different machines. The statement shown in line 190 will generate a random number between one and ten.

The logical operator AND in lines 320,490,500 might have



to be changed as some machines do not support this sort of comparison. The way to replace the AND statement is to reduce it to a number of IF...THEN statements to check whether the condition is true.

Finally, if you are converting this program to run on a VIC 20 then all you have to worry about is adjusting the PRINT statements so that the lines do not wrap around on the VIC's smaller screen.

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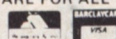
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COMPUTER USERS CLUB

In Clubhouse this month we take a look at the Crawley Computer Club and also bring you a round-up of new, recently and soon-to-be-started computer clubs.

The Crawley Computer Club is a small group of amateur computer enthusiasts who live locally and meet to help each other out and exchange views on their favourite hobby, personal computing.

Their meetings are informal affairs as they find that this helps members discuss their problems and interests without constant interruption. From time to time they arrange special evenings where guest speakers come down and enlighten them on further facets of the computer field.

Membership is made up of people that come from all walks of life interested in computers. Some of the members are more interested in hardware, spending their time building interfaces and other wonderful gadgets to plug into their machines, whilst others are more interested in software, writing games and utilities. Some members have been experimenting with word processing and accounting. Most of the club members prefer to stick to BASIC as a language except a few of the more adventurous who have moved on to assembly code and PASCAL in order to give full range to their programming concepts.

The club does not specialise in one particular machine and the computers owned by the members range from ZX80/81s and Acorn Atoms at the low end, to the Apple II and the Video Genie at the top end. Most of the commercially available machines are well represented along with a few from enterprising people who have designed and built their own.

Don't be afraid to go along to the club for the first time, whether as a novice or as a seasoned campaigner, there are many people who will help you with your problems, or argue with you over the best way to POKE your machine.

Meetings take place twice a month on the first Tuesday of the month at the Broadfield Community Centre in Broadfield Barton, Crawley. The meeting starts at about 7.30pm and usually runs until about 10.00pm. Members bring along their own machines so that they can demonstrate their latest mind-boggling creations. On the third Tuesday of each month the club transfers its headquarters to a local hostelry, the Tavern on the Green in Pound Hill, Crawley, where the club members discuss any new developments in the salubrious surroundings of the bar, downing a few pints of the local brew. This could result in many interesting advances in computer technology that can't be remembered in the morning.

If you are interested in joining, the subscription for a year is £6 and the people to get in touch with are:

Max Clark
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Chris Seager
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43 Jewel Walk
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Club Call-Up

Leaving the Crawley Computer Club and heading north we encounter another alcoholically powered computer group, in the form of the VIC-Pet Computer Club. Members meet fortnightly in the Spread Eagle, Oakley Hay, near Corby, Northants and as the name suggests they concentrate on the Commodore range of computers. For further details contact:

P Wilson
26 North Cape Walk
Corby
Northants
NN18 9DQ
Telephone: (0536) 742622

Moving on we travel to Blackburn in Lancashire where a new club is forming, The Club, which hasn't got a name yet, but plans to meet on the first Monday of each month at a yet undecided venue. The club is also hoping to publish a monthly journal and contributions are welcome from anyone, whether they are a member or not.

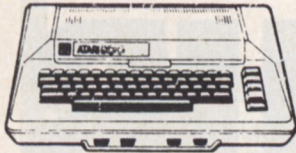




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3 Steak in Guinness serves 2
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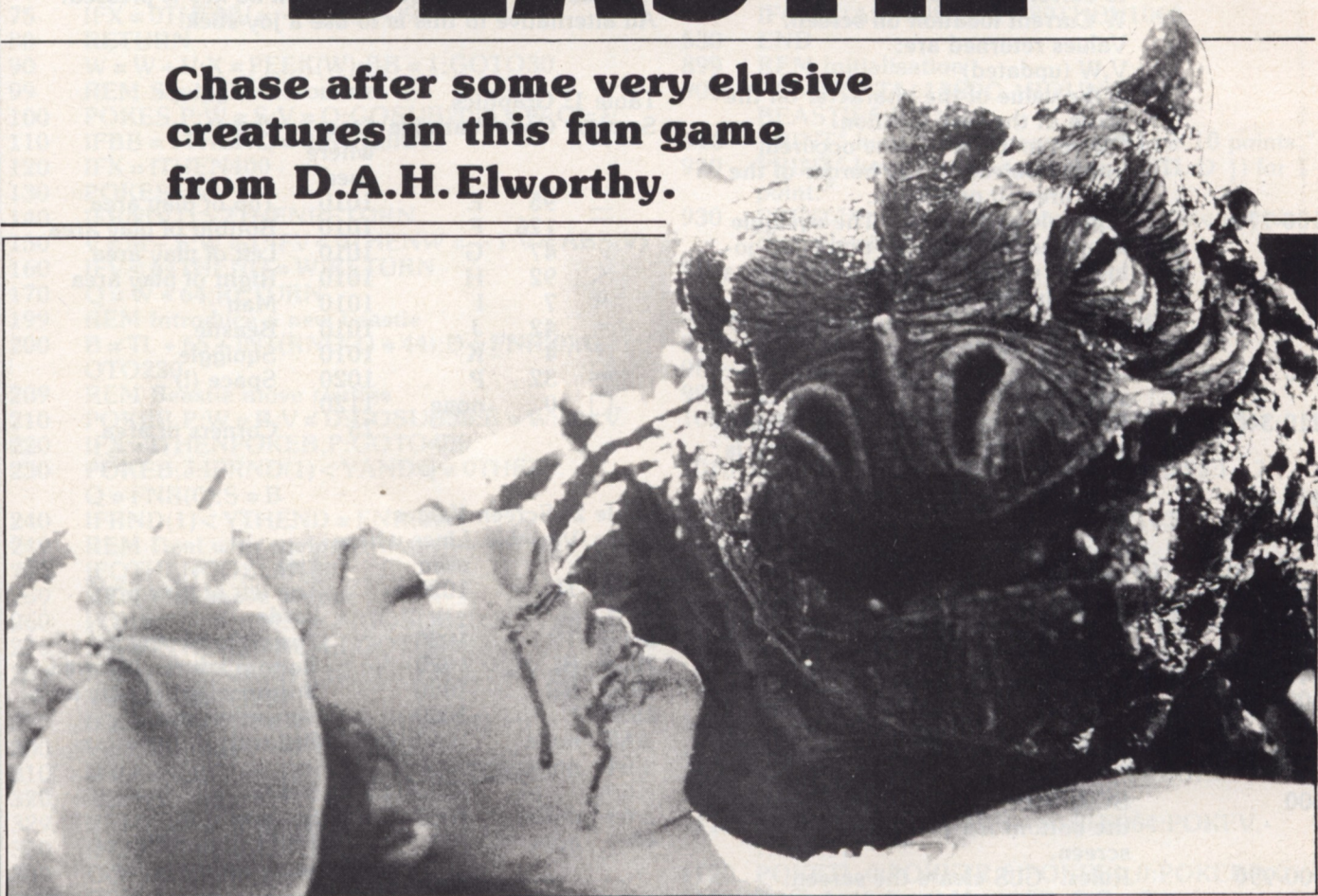
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BOUNCING BEASTIE

Chase after some very elusive creatures in this fun game from D.A.H. Elworthy.



This game runs on a Nascom with BASIC and NAS-SYS, but can easily be adapted for any machine with BASIC and a memory-mapped display. The aim is to chase after the "beasties" and "squiggles". If you run into them, you score ten points and one point, respectively. However, if they hit you first, then your "man" is destroyed. You have three men in total.

Beasties appear somewhere along the top line of the play area on the screen, and then bounce provocatively around. Occasionally, they undergo a random change in direction, or release a squiggle. The probability of either of these events occurring depends on the skill level

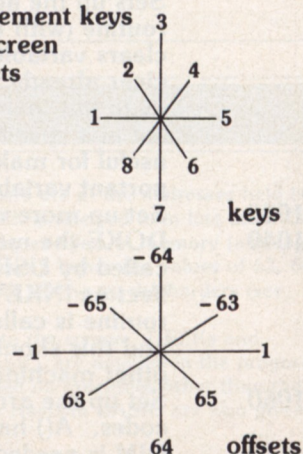
chosen, multiplied by a constant.

This constant is contained in line 1070; 0.05(1 in 20) has been found to give a satisfactory starting probability at a skill level of one. Once on the screen, a squiggle moves in a straight line at twice the speed of men and beasties, and may start to home in on you, with a probability of five times the value set up above. Fortunately there is only one squiggle on the screen at a time.

If you kill a beastie, probabilities are doubled. Whenever a man is killed, the current score and number of men left are shown on the screen. Movement is controlled by keys 1 to 8 (see figure 1), with 0 meaning stop. All other keys are ignored.

Figure 1:

**Movement keys
& Screen
offsets**



HOW IT RUNS

The program requires about 1½kbytes of memory.

10 Sets up FNR to generate random direction codes, and jumps to the initialisation routine.

20-90 Move subroutine. The parameters are:
V direction code (i.e. value added to current location),
W Current location on screen.
Values returned are:
V,W (updated)
X the value of the character on the screen at the new location.
BB set to 1 if a bounce occurred, i.e. the object hit the border of the play area; 0 otherwise.

100-170 Squiggle subroutine. The squiggle is moved, and checks made for going out of play, and collision with a man. In the latter case, a jump is made to 400. Otherwise a normal return is made.

200 Introduces a new beastie to the screen.

210-340 Routines to move beastie, squiggle, man, and beastie again. A jump is made to 400 if a man is hit.

400-460 Dead man: checks for end of game. If so, jumps to 500. Otherwise shows score, waits, erases it, and either continues with a new beastie, or returns.

420 SCREEN10,7 puts the cursor at line 10, position 7

440 As line 420

500-530 Game over: gives final score, and tests for restart.

520 Test for a string starting with 'y' or 'Y'.

500 SCREEN1,15 puts the cursor at the bottom left corner of the screen.

900-990 Rules. CLS clears the screen.

920 [CTL D] is the squiggle symbol (see Table 1).

1000 Sets up the address of the USR routine (with DOKE), and clears variables. Actually they're clear already, but this line allows us to put them in BASIC's variable list in a specific order, which is useful for making fast access to important variables.

1010-1020 Set up more variables.

1030-1040 DOKE the machine code routine, called by USR(0). It has the same effect as INKEY, GET, etc. The routine is called once, at line 300, and this should be changed on other machines.

1050-1060 Set up the array of movement codes. A() has dimension 8, so no DIM is needed.

1070 Sets up probability Y, and clears screen. A restart comes here.

1080-1120 Draws border around play area.

1130-1140 Initialises values, and starts the game.

If you find that using keys 1-8 is inconvenient, then change the input function called at 300, so that the keys that you use are converted to values in the range 49-56, corresponding to the ASCII codes of 1-8. A code of 0 should be returned if no key is pressed. An alternative to this is to use a joy-stick.

Table 1: Graphics

Symbol	Code	Variable	Lines where used	Use
—	95	E	1010	Top of play area
—	126	F	1010	Bottom of play area
/	47	G	1010	Left of play area
\	92	H	1010	Right of play area
⊙	7	I	1010	Man
*	42	J	1010	Beastie
⋈	4	K	1010	Squiggle
[SPC]	32	P	1020	Space (!)
□	0	none	1120, 75	Corners of area

Table 2: Screen Values

Value	Variable	Lines where used	Use
2058	TL	1020	Top left of play area border
2103	TR	1020	Top right of play area
2954	BL	1020	Bottom left of play area
2999	BR	1020	Bottom right of play area
2530	U	1020	Screen centre
±65	none	1060, 200	See text
±64	none	1060, 100, 1110	See text
±63	none	1060	See text
44	none	200	TR-TL-1 = width of game area

Table 3: Variables not listed in tables 1 or 2

A()	Address offsets for various move directions
A	Address offsets for man movement, or 0 if stopped
D	"beastie"
Q	"squiggle", or 0 if no squiggle
M,B,S	Locations of man, beastie and squiggle, respectively
L	Skill level
N	Score
T	Number of men left, including one on screen
V,W	Various temporary values
X	See program breakdown, line 20
Y	Probability
Z	Y times 5
BB	Bounced flag

PROGRAM LISTING

```

1  REM Bouncing beastie - D. A. H. Elworthy -June
82
10  DEFFNR(X) = A(INT(RND(1) * 8 + 1)):GOTO900
19  REM Move subroutine. Full details in text
20  W = W + V:BB = 0:X = PEEK(W)
30  IFX = PTHENRETURN
40  IFX = ETHENV = V + 128:GOTO90
50  IFX = FTHENV = V - 128:GOTO90
60  IFX = GTHENV = V + 2:GOTO90
70  IFX = HTHENV = V - 2:GOTO90
75  IFX = 0THENV = - V:GOTO90
80  RETURN
90  W = W + V:X = PEEK(W):BB = 1:GOTO30
99  REM Squiggle subroutine
100 POKES,P:W = S:V = Q:GOSUB20:S = W:Q = V
110 IFBB = 1THENQ = 0:RETURN
120 IFX = ITHEN400
130 POKES ,K
140 IFRND(1) > ZTHENRETURN
150 V = M - S:W = 1:IFV < 0THENW = - 1:V = ABS(V)
160 IFV < 64THENQ = W:RETURN
170 Q = W * 64:RETURN
199 REM Introduce a new beastie
200 B = TL + 65 + INT(RND(1) * 44):D = FNR(0):G-
    OTO230
209 REM Beastie move routine
210 POKEB,P:W = B:V = D:GOSUB20:B = W:D = V
220 IFX = ITHENPOKEB,P:GOTO400
230 POKEB,J:IFRND(1) < YANDQ = 0THEN
    Q = FNR(0):S = B
240 IFRND(1) < YTHEND = FNR(0)
249 REM Deal with squiggle, if any
250 IFQTHENGOSUB100
259 REM Man move routine
260 POKEM,P:W = M:V = A:GOSUB20:A = V:M = W
270 IFX = PTHENPOKEM,I:GOTO300
280 IFX = JTHENN = N + 10:POKEM,I:Y = Y * 2:Z
    = Z * 2:GOTO200
290 IFX = KTHENN = N + 1:POKEM,I:Q = 0
300 V = USR(0):IFV = 0THEN330
310 IFV < 49ORV > 56THENA = 0:GOTO330
320 A = A(V - 48)
329 REM Squiggle again
330 IFQTHENGOSUB100
340 GOTO210
399 REM dead man routine
400 T = T - 1:IFT = 0THEN500

410 Q = 0:POKES,P:POKEB,P:A = 0:M = U
420 SCREEN10,7:PRINT"Score:"N"Men left:"T
430 FORV = 1TO1000:NEXT:SCREEN10,7
440 PRINT" [ 30SPC ] "
450 IFQTHENRETURN
460 GOTO200
499 REM end of game
500 SCREEN1,15:PRINT:PRINT:PRINT"Final
    score"N
510 INPUT"Another game":AS
520 IF(ASC(AS)AND223) = 89THEN1060
530 END
899 REM Initialisation
900 CLS:PRINT" [ 15SPC ]BOUNCING
    BEASTIE":PRINT
910 PRINT"Jump on the beasties ( * ) for 10 points."
920 PRINT"Jump on the squiggles ( [ CTL D ] ) for 1
    point."
930 PRINT"You have three men. Move them with
    the following keys:"
940 PRINT" 3"
950 PRINT" 2  4"
960 PRINT"1 .  5  0 stops movement."
970 PRINT" 8  6"
980 PRINT" 7"
990 PRINT"Good luck:":PRINT
1000 DOKE4100,3200:A = 0:B = 0:C = 0:D = 0:M = -
    0:Q = 0
1010 R = 0:S = 0:E = 95:F = 126:G = 47:H = 92:I = 7:-
    J = 42:K = 4
1020 P = 32:U = 2530:TL = 2058:TR = 2103:BL = 2954:
    BR = 2999
1030 FORV = 3200TO3210STEP2:READW:DOKE
    V,W:NEXT
1040 DATA25311,312,18351,10927, - 8179,233
1050 FORV = 0TO8:READA(V):NEXT
1060 DATA0, - 1, - 65, - 64, - 63,1,65,64,63
1070 INPUT"Skill level":L:Y = .05 * L:CLS
1080 FORV = TL + 1TOTR - 1:POKEV,E:NEXT
1090 FORV = BL + 1TO BR - 1:POKEV,F:NEXT
1100 FORV = TL + 64TOBL - 64STEP64:POKEV,G
    :NEXT
1110 FORV = TR + 64TOBR - 64STEP64:POKEV,-
    H:NEXT
1120 POKETL,0:POKETR,0:POKEBL,0:POKEBR,0
1130 T = 3:A = 0:C = 0:M = U:N = 0:Q = 0
1140 Z = 5 * Y:GOTO200

```

HINTS ON CONVERSION

The three tables give details of graphics, screen references, and variables.

Obviously, different machines run at different speeds. The BASIC used was NASCOM ROM BASIC. If the program is found to run too fast, I suggest that line 20 be renumbered 25, and this line entered:

```
20 FORAA = 1TON:NEXT where n is a value which gives an
acceptable speed.
```

The play area is 44 spaces wide, by 13 lines deep (excluding

borders); the corners of the borders are at the addresses held in TL, TR, BL and BR, and the width is referred to in line 200. On the Nascom screen lines are 64 bytes apart in memory (although only 48 bytes of those 64 are shown); hence the values of 63, 64 and 65 used for movement, and in setting up the borders (see Table 2).

All PEEKs and POKES are to the screen. DEEEKs and DOKEs, peculiar to Nascom BASIC, are detailed in the program breakdown, and will not be needed on machines other than the Nascom. Commands specific to Nascom BASIC are also given in the How It Runs section.

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USER DEFINED GRAPHICS

Ever wondered how to make a Space Invader? David Harwood shows you how to get the most out of your Spectrum graphics.

Before starting to define characters on the Spectrum, we must first understand how numbers are stored in computers.

The Spectrum, and other computers, hold numbers in binary form, which is another name for base 2. We work with decimal numbers, base 10, where the digits can be from zero to nine. In base 2 the digits can either be one or zero.

The groups of one's or zero's, which are called bits (short for *binary digits*), are held in the computer in sets of eight, known as bytes.

A single byte can be any number, in decimal 0-255, in binary 00000000 to 11111111.

To change binary to decimal we must look at the position of the 1's. Let us look at an example (Fig. 1)

Figure 1

128	64	32	16	8	4	2	1
2^7	2^6	2^5	2^4	2^3	2^2	2^1	2^0
1	0	0	0	1	1	1	1

and see how this works. The first column is 2^0 so if there is a 1 in the first column, add 1 to our new decimal number. The second column is 2^1 so if there is a 2 in the second column, let us add 2 to our decimal number. The third column is 2^2 so if there is a 1 in the column, add 4 to our decimal number and so on up to 2^7 .

We now have found out that 10001111 is $1 + 2 + 4 + 8 + 128 = 143$.

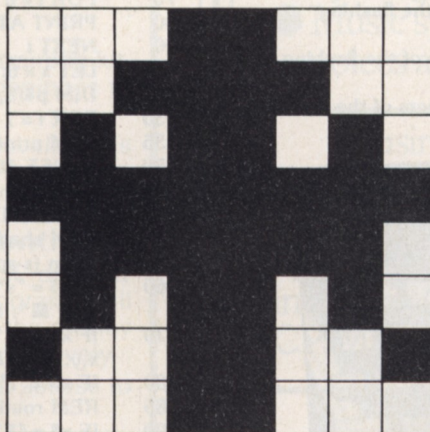
You may be asking yourself what has this got to do with defined characters. In order to define your own character, draw an 8 by 8 grid,

and draw your character on this grid, shading in the required squares.

Each row of eight squares can now be thought of as a byte (eight-bit binary number) with a 1 representing a shaded square and a 0 representing an unshaded square.

Let us consider drawing an invader.

We can convert the invader character (Fig. 2) into eight bytes. **Figure 2**



(0—unshaded: 1—shaded).

00011000 1st Byte
00111100 2nd Byte
01011010 3rd Byte
11111111 4th Byte
01111110 5th Byte
01011010 6th Byte
10011001 7th Byte
00011000 8th Byte

Binary numbers can be entered directly on the Spectrum by using the BIN command. If you type in PRINT BIN 10001111, the computer will print the decimal form of this number. You are allowed to use BIN in an INPUT statement.

Having converted the invader into binary numbers we must now assign it to a key, so that when we

press this key in graphics mode we get the invader character. (Defined characters can be assigned to the letters A to U). In order to do this we must store the eight bytes at eight separate addresses (places in the memory). If, say, we pick the letter "i" to have the invader character, then USR"i" is the first address to store the first byte, USR"i" + 1 is the second address to store the second byte and so on. So for our invader character, type in:

```
POKE USR"i", BIN 00011000
POKE USR"i" + 1, BIN 00111100
POKE USR"i" + 2, BIN 01011010
POKE USR"i" + 3, BIN 11111111
POKE USR"i" + 4, BIN 01111110
POKE USR"i" + 5, BIN 01011010
POKE USR"i" + 6, BIN 10011001
POKE USR"i" + 7, BIN 00011000
```

Typing in "i" in graphics mode will now give you an invader character, which can be treated like any other character and is also able to be printed on the printer.

Fig. 3 shows this program.

On running it, you will be asked for the letter to be assigned the defined character, which is stored in A\$, and then you will have to type in the eight binary numbers for that defined character.

The Program

Drawing characters on paper is very time consuming so I have included a program (Fig. 4) which allows you to design a character on the screen and then assign it to a certain key. On running the program, an 8x8 grid will be shown with a flashing pointer in the first box. You can either move over every box automatically or by using the cursor controls move to any point in the grid.

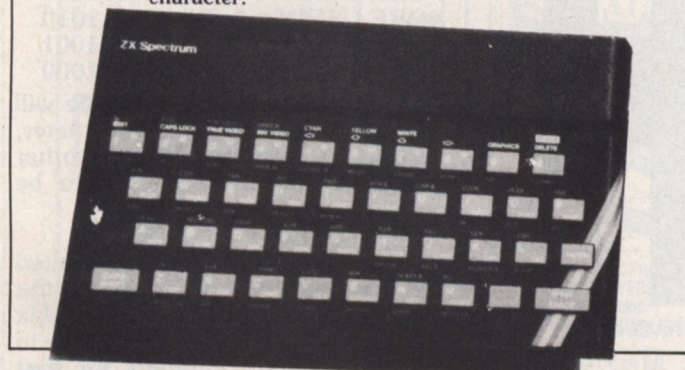
USER DEFINED GRAPHICS

HOW IT RUNS

Lines 10 - 50 Defines a box character for use in the grid.
 Lines 70 - 90 Prints the 8 x 8 grid. (To get the box, press 'p' in graphics mode).
 Line 110 Sets the screen position.
 Lines 120 - 130 Sets up 8 binary numbers (value 0) into a string.
 Line 135 Prints flashing cursor in first box.
 Lines 150 - 250 Shades a square if 's' is pressed. Leaves a space if 'u' is pressed. Moves around the grid depending on what cursor keys you press.
 Lines 190 - 200 Will print, from where you have moved, a shaded or unshaded square, according to what was there before. If these lines were not there you would get flashing cursors in every position where you went. Erase these lines to see what happens.
 Line 210 Will add 1 to X if X\$ = "6" and subtract 1 from X if X\$ = "7".
 Line 220 Will add 1 to Y if Y\$ = "8" and subtract 1 from Y if Y\$ = "5".
 Lines 230 - 240 Will move you to the opposite square if you get to the edge of the grid.
 Lines 255 - 263 Prints over the pointer.
 Lines 264 - 320 Assigns your character to a chosen key.
 Line 265 LINE L\$ will await for a string input, although the quotes are not printed.
 Line 300 CHR\$ (CODE L\$ + 47) is the character L\$ in graphics mode.

List of Variables

T Is a dummy variable, as it has no real purpose, only being used as a control in a loop.
 A Holds the value of the defined box character.
 I Used in a loop for printing the grid - a row at a time i number of lines down the screen.
 X Used to hold x (line) co-ordinate of the flashing pointer.
 Y Used to hold y (column) co-ordinate of the flashing pointer.
 P\$ (8,9) Used to store the eight binary numbers of the defined character.



HINTS ON CONVERSION

If you wished to change the program to your computer, providing it is capable of user defined characters, you would have to change lines 30 - 50, which define a box character (on the BBC micro, for instance, you would put: 30 VDU 23, 255, 255, 129, 129, 129, 129, 129, 255) to suit your micro. Also lines 265 - 290 would have to be changed to whatever system your computer uses to create user defined graphics.

The string handling can be implemented on to your computer if you change line 130 to:

```
130 FOR t = 1 to 8: LET p$(t) = "BIN": NEXT t
and then add the following line:
```

```
131 FOR t = 1 to 8: FOR s = 1 to 8: LET p$(t,s) = "0": NEXT s: NEXT t
```

(P\$ (8,9) reserves 8 dimensioned strings, each of 9 spaces long. The first space is used to hold BIN, the other 8 are used to hold the binary number. We can then use VAL P\$ (L) where t is 1 - 8, to work out the value of the string).

X\$

Stores key pressed.

L\$

Used to hold letter to be assigned new character.

C\$

Used to hold yes or no, whether to finish or return to program.

PROGRAM LISTING

Figure 3

```
10 INPUT "Type in letter to be assigned character ";A$
20 FOR t = 0 to 7
30 INPUT "type in row ";r
40 POKE USR A$ + t,r
50 NEXT t
```

Figure 4

```
10 REM user defined characters
20 REM define a small bot to P
30 FOR t = 0 TO 7: READ a
40 POKE USR "P" + t,3: NEXT t
50 DATA 255,129,129,129,129,129,129,255
60 REM draw 8X8 grid
70 FOR i = 6 TO 13
80 PRINT AT i,12;"□□□□□□□□"
90 NEXT i
110 LET x = 6: LET y = 12
120 DIM p$(8,9)
130 FOR t = 1 TO 8: LET p$(t) = "BIN 00000000": NEXT t
135 REM print flashing marker
150 PAUSE 1000
153 REM scan keyboard
155 LET x$ = INKEY$
157 REM shade or leave a space depending on key held
    down (s-space u = unshaded)
160 IF x$ = "s" THEN LET p$(x - 5,y - 10) = "1": PRINT AT
    x,y;"■"; LET y = y + 1
170 IF x$ = "u" THEN LET p$(x - 5,y - 10) = "0": PRINT AT
    x,y;"□"; LET y = y + 1
180 IF x$ = "f" THEN GO TO 260
185 REM routine to move pointer around grid
190 IF x$ = "5" OR x$ = "6" OR x$ = "7" OR x$ = "8" THEN
    IF p$(x - 5,y - 10) = "0" THEN PRINT AT x,y;"□"
210 LET x = x + (x$ = "6") - (x$ = "7")
220 LET y = y + (x$ = "8") - (x$ = "5")
230 IF y = 20 OR y = 11 THEN LET
    y = 19*(y = 11) + 12*(y = 20): LET
    x = x + (y = 12) - (y = 19)
240 IF x = 5 OR x = 14 THEN LET x = 13*(x = 5) + 6*(x = 14)
250 GO TO 140
255 REM print over pointer
260 IF p$(x - 5,y - 10) = "0" THEN PRINT AT x,y;"□"
263 IF p$(x - 5,y - 10) = "1" THEN PRINT AT x,y;"■"
264 REM routine to assign character to a key
265 INPUT "letter (a - v) to be assigned character "; LINE ($
270 FOR t = 0 TO 7
280 POKE USR L$ + t,VAL (p$(t + 1))
290 NEXT t
300 PRINT AT 20,0;"Here is the character ";CHR$ (CODE
    L$ + 47)
310 INPUT "Is this alright? (yes or no) "; LINE c$
320 IF c$(1) = "n" THEN LET x = 6: LET y = 12: GO TO 140
```


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LOOK BEFORE YOU LEAP

In the second of our regular series on computer dealers we look at the Tandy Computer Centre to find out what they can do for you if you want a TRS 80.

Tandy Computers is the only computer manufacturer to build up a chain of high street stores selling a complete range of its products.

The idea is based around a single concept to provide hardware, software and support for anybody who wants to use a TRS-80 computer in either business, hobby or educational applications. Now there are 18 Tandy Computer Centres throughout the country with plans to double this figure over the next year.

Inside a Tandy Centre you will find everything you need displayed neatly and accessibly which is a welcome change. These centres are set up as places where a person can go to find the right machine for the purpose they want, take advantage of support and trained on the computer. The one I saw looked as if the idea works. Each centre carries the full range of Tandy computers, starting at the small hand-held computer, through the Model I and III and the Color Computer, to the Model II machine, which is the business work horse. These are all fully supported with disc units and printers to suit anybody's needs.

The first striking thing when you go into a Tandy Centre is the range



of machines on display and being demonstrated. There are plenty of staff capable of showing you virtually any facet of the machines on show. Present at the centres are a computer marketing representative, who looks after the business side of the machines, a customer support representative, who is responsible for the software packages and the applications training, and an engineer. This means that on top of the normal sales staff there are people around who should be able to handle any problems that are thrown at them.

One great advantage with the Tandy shops is that they are a part of the organisation that develop and build the machines. This alleviates the problem that most computer buyers run across in trying to get information from a dealer who is usually out of touch with the supplier and under-informed about the product and its peripherals. This is solved in the Tandy shops where you

can buy Tandy's own range of accessories, such as printer ribbons, discs and cassettes, for all their machines.

The TRS-80 range of computers rank high in support as far as software goes, and the Computer Centres really make the most of this. Apart from stocking and demonstrating their own range of software, they also have produced a massive directory of independent software which gives details of where you can buy it, what it does and on what machines it runs. This valuable document retails for under £1.00 and is obtainable from the shops.

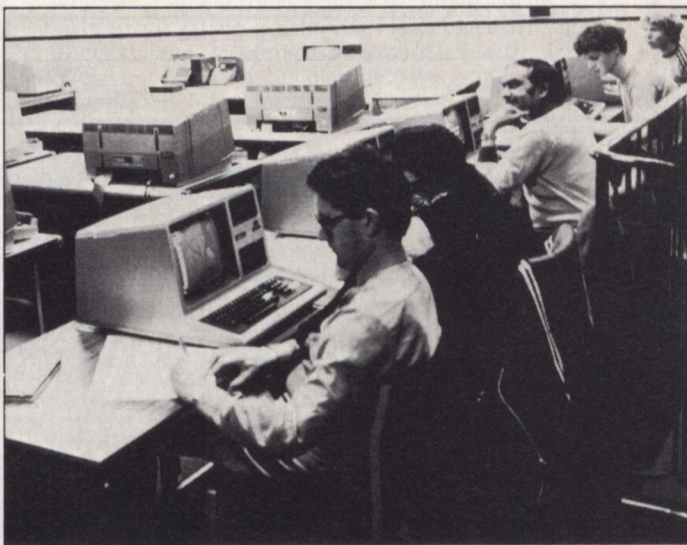
The support doesn't stop there though because at each Computer Centre there is a full classroom facility. This is used primarily to give courses to the business users, giving them training on the packages they have bought and on the computer concept in general. For the home or hobbyist user the

classrooms are available for people to run 'teach ins' on Saturday mornings. You can get details of courses when you buy a machine.

These sessions are run by ordinary users who feel like sharing their knowledge with anybody who is interested. Each classroom is very well fitted out with different machines that can be interconnected to allow the teacher (or educator, as Tandy call them) to monitor what the pupils are doing and give them assistance through their computer screens.

For user groups Tandy produces a newsletter available through the shops and Tandy will actively participate in workshop schemes that the clubs run themselves as well as making the classrooms available.

If you are interested in buying a Tandy computer a visit to your local centre is very worthwhile and will give you a clear idea of what the machines can do and whether any of them are up your street.



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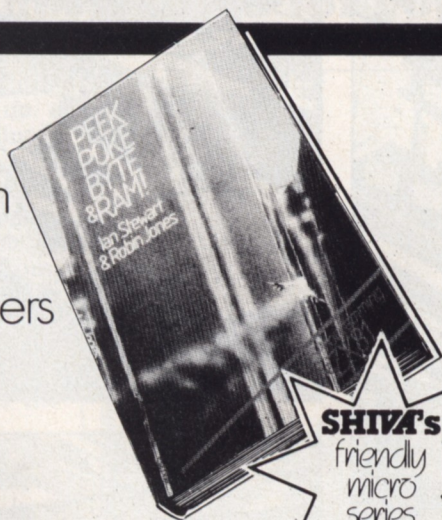
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MEMORY SAVING ON THE ZX81

Having trouble fitting your programs into a ZX81? Then follow these suggestions by Philip Coley.

The Sinclair ZX81 is an amazing machine, but as all users of the basic 1K unit know the memory space available only allows very small programs to be written. To enable more complex programs to be run requires the use of various space saving tricks so that you can squeeze more into the available memory. This article deals with the amazing uses for the function PI and the memory saving techniques they allow.

One of the largest users of storage space is the use of numeric literals within a program. The method in which these are stored is shown in diagram 1a. This is an example of a command line to print the letter A three spaces in. It shows that seven bytes or characters are required to store the number. Diagram 1b shows the same command line substituting PI for the number three, this shows a saving of six bytes, resulting in a 1/3 saving in space for the entire line. However the way the Sinclair system operates means that where a number 3 is required in a basic command, the function PI can be substituted instead. Examples of this substitution are shown in Table 1. Most of them are clear cut, but an interesting point is shown by the use of GOTO PI instead of the commonly used GOTO 10 at the end of a program. GOTOs in ZX81 BASIC do not have to specify the exact line to be gone to. Instead it first looks for the number and if that is not found it then looks for the first line number above it. As GOTO 10 usually means GOTO the beginning of a program, GOTO PI can be used instead and give a substantial saving in memory space. A normal line containing GOTO 10 will use 14 bytes, whereas GOTO PI uses 7 bytes, a saving of 50%. Therefore consistent use of PI to replace the number 3 in command lines will result in considerable savings in memory space. In addition, this



method has the advantage of not radically altering the program and making it difficult to understand.

Further Savings

There are further space savings that can be made using PI. The various combinations of the other functions with PI produce several useful numbers. The various usable combinations are shown in Table 2. The numbers 0 and 1 are commonly used in all programs and different methods are shown to generate them. The choice of method used will depend on circumstances. All the functions except for NOT have a high priority for calculation and are dealt with first by the basic interpreter. If the number 0 is required in a calculation or in an evaluation statement like IF...THEN, then it is preferable to use SIN PI or TAN PI so as to avoid the use of brackets, which themselves use extra memory space. However in a line where the

calculation of the PI function is the only sum, for example in a FOR...NEXT loop, then the use of NOT PI is preferable as it is calculated faster. The statement PI-PI also results in a 0 but as it uses 3 bytes of storage and has a low priority, it is not to be recommended.

If the number 1 is required then the statement SGN PI is nearly always to be preferred. It has a high priority and uses only 2 bytes of storage. This is to be compared with the 3 bytes required for the statement PI/PI and the time consuming division it requires.

The other two integer numbers which can be generated from two functions are -1 from COS PI and 3 from INT PI. These are self evident and can be used anywhere that these numbers would be required.

These numbers are so economical in their use of memory that further savings can be made by

removing unnecessary LET commands. In most programs a great deal of use is made of the LET command to set up variables, for instance LET A = 1. This example uses 15 bytes of memory space for the program and an additional 6 bytes for storage of the variable, a total of 21 bytes. Even if a space saving NOT PI is used instead of the number 1 a total of 16 bytes is still required. In addition each time the variable is specified in the program an extra byte of storage is required. If instead of assigning to a variable the numbers -1, 0, 1 and 3 the PI functions are used directly at each point where they are required, they would have to be used more than 16 times each to use more space than an equivalent LET statement. In any program where these numbers are used it pays to use them directly if they needed less than 16 times. For example the two program lines:
 10 LET A = SGN PI
 20 FOR X = A TO 3
 use 27 bytes for the program and 24

bytes for the variables, a total of 51 bytes. Whereas the line:
 10 FOR X = SGN PI TO 3
 uses only 18 bytes for the program and 18 bytes for the variables, an overall saving 15 bytes and if PI was substituted for the 3, a further 5 bytes would be saved.

Certain larger numbers can also be generated using functions and PI. Table 2 only shows the more useful in the sense that they do not use more than 3 bytes of storage each. Other numbers which could be generated can be stored more economically using other space saving techniques. The numbers can be used in BASIC commands or in calculations, although care should be taken to ensure that they are generated when required in a program. Only EXP PI and INT EXP PI will be calculated early due to their high priority. The use of PI results in a considerable saving of user memory in the ZX81. The program shown in figure 3 asks for your name and then prints Hello to you five

times before asking if you wish to run it again. If you answer anything but "Y", it will then print out the total number of bytes of program space used for lines 3 to 99. Line 9999 is a useful routine which calculates the program space not counting itself. As the program stands it uses 167 bytes, by using the techniques in this article this can be reduced to 123 bytes, a saving of 26%. Try and modify it and see if you can reach this figure.

There is unfortunately a price to be paid. In this case memory saving can result in longer running times for programs. The sample program does not really show this, but in some programs it could be a problem. However the choice for most users lies between a program which will not fit in to the available memory or a program which works slowly after using these memory saving techniques. So if you wish to squeeze more out of your ZX81 try using these PI memory saving techniques in your programs.

Table 1

```
PRINT TAB PI;"A"
PLOT PI,PI
GOTO PI
GOSUB PI
PAUSE PI
DIM S(PI)
PRINT AT PI,PI;"A"
PRINT A$(1 TO PI)
FOR X = 1 TO PI
UNPLOT PI,PI
```

Table 2

PI	= 3.1415929
SIN PI	= 0
TAN PI	= 0
SGN PI	= 1
COS PI	= -1
INT PI	= 3
NOT PI	= 0
PI - PI	= 0
PI/PI	= 1
PI + PI	= 6.2831853
PI*PI	= 9.8696044
INT EXP	
PI	= 23
EXP PI	= 23.140693
PI* *PI	= 36.46216

Figure 3.

```
3 PRINT AT 0,3;"NAME?"
10 INPUT A$
20 CLS
30 FOR X = -1 TO 3
40 PRINT TAB 3;"HELLO";A$
50 NEXT X
60 PRINT AT 6,1;"AGAIN?"
70 INPUT A$
80 CLS
90 IF A = "Y" THEN GOTO 3
9999 PRINT PEEK 16396 + 256 *
PEEK 16397 - 16565
```

DIAGRAM 1A

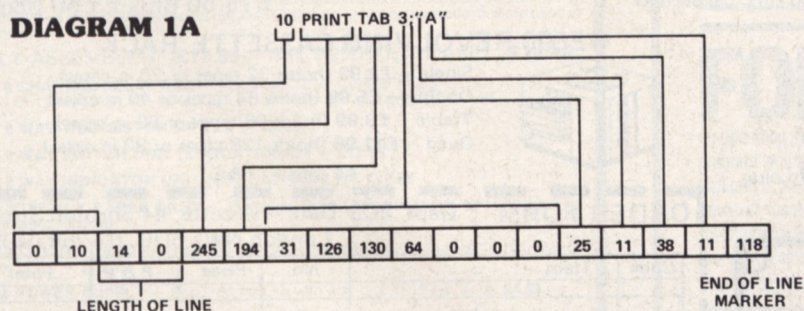
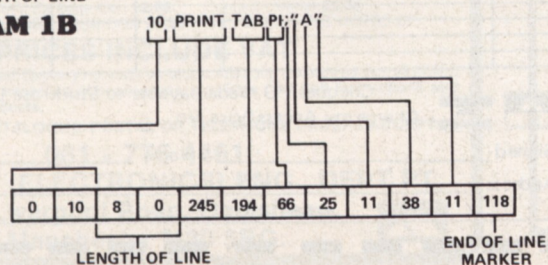


DIAGRAM 1B



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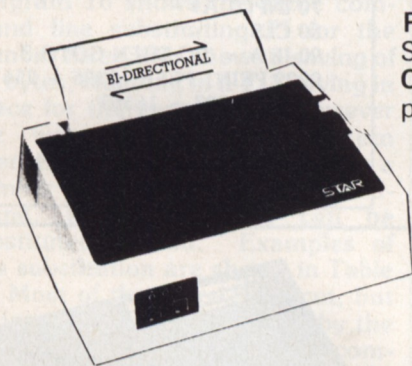
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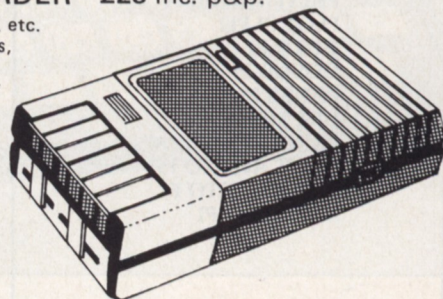
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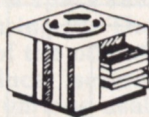
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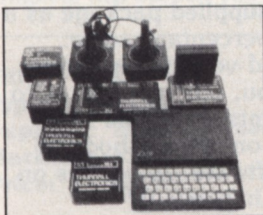
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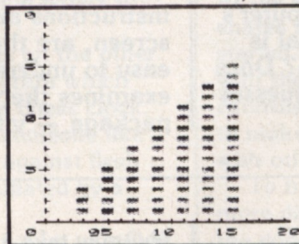
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SOFTWARE REVIEWS

This is the place to find out more about the software for your micro. Each month we review a hat-full of tapes and bring you the results.

Each month PCT will be presenting pages of reviews of the computer programs currently available. We have engaged a team of reviewers, each of whom is a seasoned user of his/her particular machine — and has the crazy streak that means they enjoy playing computer games!

All types of software will, however, be reviewed in these pages; but with around 85% of all home-computer software being of the playful variety, you will be seeing more games than anything else!

Each program is examined for ease of use, interest level, graphics, etc, and the reviews will be presented in a uniform manner to allow you to compare directly between alternatives.

Our 'Ratings Table' headings are:

Program Quality

Here we're looking to see how well written the program is, and how well it exploits the computer's capabilities. Also, how logical is the structure of the program? Does it require the user to make guesses to use it?

Crashproofing

We all hit the wrong key sometimes, do we not? Go on, admit it. If the program has been well written, all should not be lost. If, for example, the machine is asking you to enter "Yes" or "No", then any other key except Y or N should illicit no response whatsoever. In other words, how tolerant is the program of us humans?

Value For Money

Quite frankly, some software on sale today is vastly overpriced. With the low cost of cassette tapes, why *should* simple games cost up to £12 per tape? We judge this one on an overall basis — how much work have the suppliers put into the program and is the price reasonable?

Presentation On-screen

How good are the graphics used in the program? If the instructions are provided on screen, are they both readable and easy to understand? This section examines the visual aspects of the package — vital for games!

Ease Of Use

If the program is for, say, an 'action' game, then the author's choice of keys is very important. Try playing "Invaders" with the movement keys reversed, and the "Fire" button right next to 'Reset'! There are many, many ways in which life can be made easy for the program user. We want to see them *all* used!

Supplied Instructions

Regardless of whether the instructions come on sheets of paper, or are presented as text on-screen, they should be as clear and as concise as possible. One of our pet hates is when you have to LOAD twice; once just to read screens full of words and again to use the software. Pointless! Far better to supply a few Xerox sheets!

Ratings are done on a "Five stars is excellent, one is hopeless" basis, with the reviewer then scoring the supplied package as a whole on a percentage scale.

We would very much like to hear from you, our readers, as to your comments (printable ones only please) on our methods of reviewing software. Any ideas on how we can improve it?

Title: Voyager 1
Type: Tape
Supplier: Avalon Hill
Machines: TRS-80 Models I & II/TRS-80 Colour/Apple II/Atari 400, 800 32K/PET 32K
Price: £18.95

Released this year by Avalon Hill, Voyager I is one of the better 'seek and destroy' type of games. You are the only human aboard an alien spaceship that is infested by killer robots.

As you may have guessed, your mission is to either, destroy all the robots or, destroy all of the ships generators and escape yourself.

As you roam around the ships 144 locations, you are given a 3-Dimensional, "eye level", view of your locations. Using single keyboard entries, you move around the ship,

you may take a laser gun if you happen upon one, turn left or right and move forward or backwards. Occasionally you will come across an elevator which will take you to a new level within the ship, should you require it. Scattered about the ship are generators which you may destroy or use to re-charge your laser gun. There is also an escape shuttle craft which you must locate before you dare destroy the final generator. During your wanderings you use up your energy, and this is shown on a chart, to the right of your display, together with the charge state of your laser gun and the ships generators. Should you chance upon one of the killer robots, you must hope that you are not too exhausted and that your laser gun is charged.

As well as a command to Abandon Ship, there is one other command that you may call upon. This is MAP!

Pressing the M key clears the screen and gives you a graphic display of the rooms that you have searched as seen from above. Also shown on the screen are the number of robots remaining and any objects that you have discovered (eg. lasers, generators etc).

The program boasts a sound capability, but I could not make this facility work with my TRS-80 Model I, but this did not detract from my enjoyment of an excellent game that has many features not normally available on a single game. **D.B.**

Ratings Table

Program Quality	*****
Value for Money	*****
Presentation On-screen	****
Ease of Use	*****
Crashproofing	*****
Supplied Instructions	*****
Overall	80%

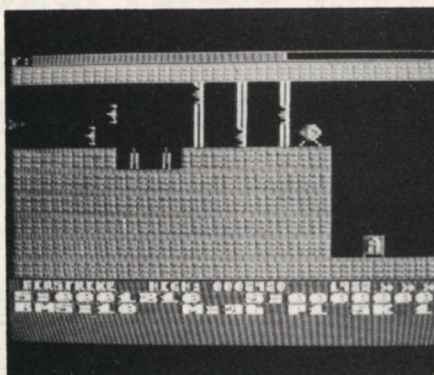
Title: Airstrike
Type: Tape
Supplier: Gemini Electronics
Machine: Atari 400/800
Price: £15.95

Airstrike is a version of the popular arcade game Scramble, whose format is very similar to the original arcade version, with a fighter craft flying horizontally across the screen through a series of caverns and mazes.

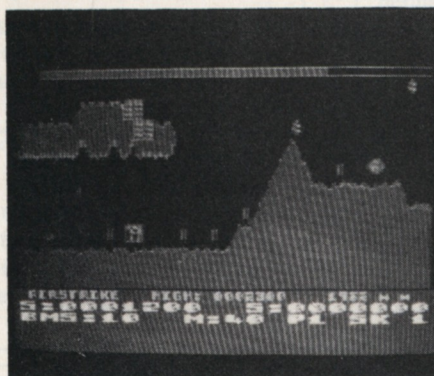
It is divided into three sections. The first section is made up of mountainous terrain which is defended heavily by surface to air missiles. Your mission is to fly through this section destroying these missiles while capturing fuel and ammunition dumps which are needed to replenish your ever dwindling supplies.

The second section is populated by fission bombs which are released by satellites and fall like rain across a central cavern through which you must pass. When you have completed these sections successfully you must then enter the labyrinth. To do this you must pass through a series of airlocks which can only be opened if you destroy their activating mechanism.

Once you have entered the first section of the labyrinth you then encounter enemy fighters which guard the airlocks. If you manage to complete this section you then start



The airlock stage.



Flying across the mountainous terrain.

back at the beginning on a new level where the action is much meaner.

Airstrike is very difficult to play and unless you are a seasoned gamerster takes a long time to master the controls. The best tactic to adopt is to con a friend, wife or lover into operating the smart bomb release button. Otherwise you literally haven't got enough hands to play the game — you need two just to manoeuvre the aircraft and operate the fire button to release missiles.

Despite this the program is well written and uses the Atari computer facilities to the full. I think that this program could easily achieve the cult status of the Atari Pac Man or Star Raiders.

Graphics in this program are up to the Atari computers usually high standard making it a delight to watch both for graphical representation and use of colour.

C.P.

Ratings Table

Program Quality	*****
Value for Money	****
Presentation On-screen	*****
Ease of Use	****
Crashproofing	****
Supplied Instructions	****
Overall	87%

Title: Chess
Type: Tape
Supplier: Sinclair Research
Machine: ZX81
Price: £6.95

Seeing how much of a chess game can be fitted into a limited memory seems to have become a game in itself amongst programmers. Psion has put in its bid with a comprehensive version for the 16K ZX81.

The game has all the standard features found on computer chess programs plus some extra features which make the game that little bit more acceptable. These are En Passant captures and Castling. Moves are input in standard algebraic notation and a diagram of the board labelling is given in the instructions.

This game also allows you to set up your own board positions and then play them out. This also means that you can change the game parameters in the middle of a game or even to change sides.

There are six levels of play with the lowest taking about five seconds to execute in full and the highest literally taking hours to think about and reply to a move. The screen display is adequate

though not stunning, using letters to stand for the pieces.

Including as a bonus on the other side of the tape is a program which simulates the action of a chess clock. A welcome addition for someone like me who prefers playing against flesh and blood to being humiliated by a computer.

C.P.

Ratings Table

Program Quality	****
Value for Money	****
Presentation On-screen	***
Ease of Use	***
Crashproofing	***
Supplied Instructions	****
Overall	70%

Title: Acquire
Type: Tape
Supplier: Avalon Hill
Machines: TRS-80 Models I & III/Apple II/PET
Price: £12.95

Acquire is a strategy game for 1 to 6 players, where the object is to start hotel chains and expand them by building further hotels around them.

At the same time, each player may buy shares in any hotel chain, even those started by other players. The player with the most shares in the chain controls that chain, and may attempt to make a profit by merging his chain with others.

To try and describe this game is more difficult than playing it, as, with the computer doing all the calculations, and updating the displayed playing board, all that is left is for the player to plan his strategy. It is hard to define the type of audience that this game will appeal to, certainly not those who only play the 'arcade' games.

The game, which does not make use of any graphic features, is written in machine language and is, therefore, fast in its reaction time.

D.B.

Ratings Table

Program Quality	****
Value for Money	*****
Presentation On-screen	**
Ease of Use	****
Crashproofing	****
Supplied Instructions	****
Overall	65%

REVIEW

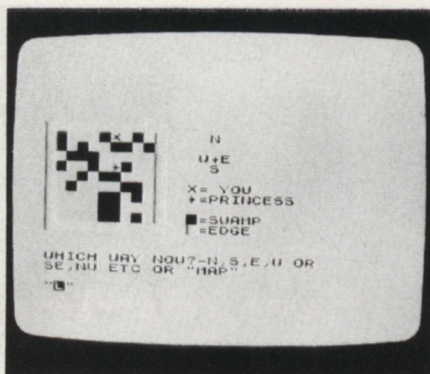
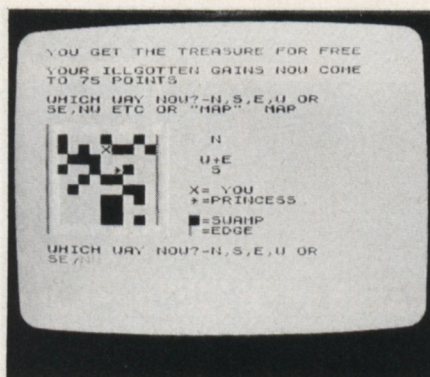
SOFTWARE REVIEWS

Title: Perilous Swamp / Sorcerers Island
Type: Tape
Supplier: Sinclair Research
Machine: ZX81
Price: Tape £4.75

Trapped in a swampy forest, dark slimy reeds surround you, deep black tar pits scattered in your path and many hideous creatures waiting in the shadows.

This is the scene that unfolds in front of you as you start the Perilous Swamp adventure. The tape has two adventures on it that run in the ZX81 with 16K memory expansion.

The adventures follow a fairly standard format, where you give the computer instructions how to move about the game map and the computer responds by giving you details of your surroundings, location, what treasure is there and what you have to do to take it. If you encounter a monster then you are given the option of fighting, running or bribing the creature to gain your freedom, or the treasure.



If you choose to fight then you are asked to pit a certain amount of strength points in the battle. The computer will then fight the battle with you and display the outcome. It is best to leave the bribery option till later in the game when you are low on combat points. However, if you feel that you don't stand a chance you can try and run, which, if you are quick enough will save you.

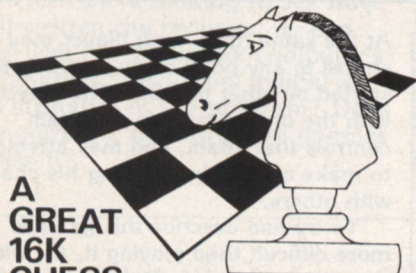
The game is fun to play even with the limitations of the computer, which seems unfairly biased to the monsters. As you leave the swamp it shows your score in terms of how many righteous monsters died guarding treasure which was rightfully theirs.

C.P.

Ratings Table

Program Quality	***
Value for Money	****
Presentation On-screen	***
Ease of Use	****
Crashproofing	**
Supplied Instructions	**
Overall	63%

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LITTLE BLACK BOOK

Sick and tired of racking your brains for a friend's right 'phone number or address? Then try out David Berry's answer to the problem with this telephone and address book so that all those important numbers are at your fingertips. Put them into your Atom and stop the frustration of dialling the wrong number time and time again.

This is a suite of three programs for the Acorn Atom. Between them they set up, maintain and examine a cassette based telephone/address list; but with very minor modifications can be converted to suit your own database requirements.

The largest program requires a lower text space of 4K, and they all need a 3K upper text space (equivalent to mode 3 graphics capability).

They use many of the facilities and tricks available in Atom BASIC such as the use of the upper text space for data storage, and selective assembly of machine code routines.

Throughout this article the American pound sign (hash) — which usually indicates hex-

adecimal numbers—has been replaced by the British pound sign (£); and the program labels, normally inverted capitals, have been replaced with lower case underlined, e.g. x.

The first program "TELEWRITE", accepts data from the keyboard, entered on a "form" displayed on the screen. Each complete form is stored as a record in memory starting at address £8200; when the memory is full (or earlier on command) the data is downloaded to the cassette tape. This sequence may continue for as long as necessary setting up a series of "pages", each containing up to 2.5K bytes of data on the cassette.

The second program "TELEREAD", draws the same form

on the screen then accepts one string as input, positioned on the form against the appropriate heading, by means of the cursor control keys. It then uses the string as a search string. The pages on the tape are loaded and searched one at a time, until a match is made, then the complete record is displayed.

"TELEAMM" completes the set by providing facilities for modifying and resaving pages of data. It is designed to be used in conjunction with "TELEREAD". First the entry to be changed is found using "TELEREAD" then, without clearing the memory or typing NEW, "TELEAMM" is loaded and run; the record address being preserved from one program to the other.

HINTS ON CONVERSION

The fact that the forms displayed by the programs are not saved on the data tape means that the programs can easily be modified to suit any other similar data storage and retrieval system. The simplest adaptations can be made by replacing my form with your own. If you do so you will need to keep the length of the headings to below nine characters, or have to change the cursor control and input string search routines in "TELEWRITE" and "TELEREAD" respectively. Additionally, if you vary the number of headings you will need to change the various loop parameters.

The following table lists the commands available to the user, obviously if you have a friend with the surname of .END you are going to have problems. Put another way: think of the commands as reserved words.

Command	Program	Effect
.END	all	Terminates run
.DSP	all	Displays contents of memory byte by byte.
.LDT	TELEWRITE, TELEAMM	Loads page of data to tape.
.CLR	TELEREAD	Clear memory (automatic in TELEWRITE).
.ALL	TELEREAD	Displays all records on current page.

.MVE	TELEAMM	Moves data pointer to address entered after prompt.
.ERR	TELEWRITE	Aborts current record input moves data pointer back to start of record to allow overwrite.

"TELEWRITE" will only accept commands entered as the first line of input (i.e. in the "SURNAME" position), except for .ERR which may be in any line except the first line.

The flashing "STOP TAPE" signs can be turned off by holding down the shift key. This key is also the one to press to change the displayed data during a .DSP sequence.

Prompts may be answered by "YES", "NO" or any string starting with "Y" or "N". Default is usually "N", so pressing the return key counts as a "NO". This is useful in a number of situations, notably when used simultaneously with the repeat key to step through all the records after the .ALL command.

If all this sounds confusing, that's because it is much more difficult to describe than demonstrate. The name of the game is "experiment" so if you think a particular command sequence should work give it a try — it probably will.

PROGRAM LISTING

"TELEWRITE" LISTING PROGRAM

```

10 DIM B(12),LL(1)
20 aH=0
30 P.$12,'''''''''CLEARING MEMORY"
40 A=£8200
50 GOSUBz
60 cP.$12
70 PRINT"sp9 TELEPHONE LIST" ' "spll DATA INPUT"
80 PRINT" SURNAME" ' "INITIALS" ' "ALTNAME" '
   "STD CODE" ' "sp2 NUMBER"
90 PRINT"sp3 HOUSE" ' "sp2 STREET" ' "sp4 TOWN"
   "sp2COUNTY" ' "POSTCODE"
100 PRINT" sp3 NOTES"
110 FOR V=0 TO 10; P.$£0B; N.
120 M=A
130 H=H+1
140 GOSUBw
150 INPUT $A
160 IF $A=".DSP" GOTOj
170 IF $A=".END" P.$12,'''''''''TERMINATED!"; END
180 IF $A=".LDT" GOTOb
190 R=£20
200 U=£48
210 FOR V=1 TO 10
220 U=U+£20
230 ?£EI=0
240 ?£DE=U
250 ?£EI=£80
260 ?£8060=£09
270 ?£8128=R
280 IF V=6 THEN ?£8008=£20; U=U+£20
290 A=LEN(A)+1
300 GOSUBw
310 INPUT $A
320 IF $A=".ERR" A=M; H=H-1; G.c
330 R=?£8128
340 IF R=£A0 THEN R=£20
350 IF U=£E8 THEN £DE=£80008108
360 NEXT V
370 A=A+LEN(A)+1
380 $A="EOR+"
390 A=LEN(A)+1
400 IF A>=£8AC4 P.$12,'''''''''MEMORY FULL!"; GOTOd
410 GOTOc
420 bP.$12,'''''''
430 A=LEN(A)+1
440 d$A="EOP£"
450 PRINT" LOAD TAPE"
460 INPUT $B
470 IF CH$B<>£59 PRINT"TERMINATED!"; END
480 H=H-1
490 Q=FOUT" "
500 FOR N=£8200 TO £8BFF
510 BPUT Q,?N
520 IF ?N=0 THEN P."PAGE LOADED!"; GOTOg
530 NEXT N
540 eP.$7; D0
550 ?£8140=£100F1413; ?£8145=£05100114; FOR
   W=1TO30; WAIT; N.
560 ?£8140=£20202020; ?£8145=£20202020; FOR
   W=1TO30; WAIT; N.
570 UNTIL ?£B001<>£FF
580 P."DO YOU WANT TO LOAD MORE DATA"
590 INPUT $B
600 IF CH$B=£59 GOTOa
610 PRINT"TERMINATED!"; END
620 wS=35830-A
630 K=1
640 FOR J=4 TO 1 STEP -1
650 J?£81FA=S/K%10+£30
660 K=K*10
670 NEXT J

```

```

680 ?£81F9=£0D; ?£81FA=£3D
690 K=1
700 FOR J=2 TO 1 STEP -1
710 J?£81F5=H/K%10+£30
720 K=K*10
730 NEXT J
740 ?£81F4=£12; ?£81F5=£3D
750 RETURN
760 zP.$21; P=£2800
770 £EA0=£008C8200
780 [ \ CLEAR MEMORY 8200 TO 8BFF
790 :LLO LDX £A2; LDY £A3
800 :LL1 STA(£A0),Y; INY
810 BNE LL1; INC £A1; CPX £A1
820 BNE LL1; RTS
830 ]
840 LINK LL0
850 P.$6; RETURN
860 fp.$12
870 FOR C=£200 TO $A00 STEP £200
880 FOR D=£8000 TO $81FF
890 E=C?D
900 IF E<£80 E=E:£60
910 E=E-£20
920 ?D=E
930 NEXT D
940 DO UNTIL ?£B001<>£FF
950 NEXT C
960 A=M; H=H-1
970 GOTOc

```

(Note: 'sp4' means 4 blank spaces etc.)

TELEREAD PROGRAM LISTING

```

10 @=0
20 DIM M(63),N(10),LL(1)
30 aP.$12
40 P."sp9 TELEPHONE LIST" ' "sp11 DATA OUTPUT"
50 P."SURNAME?" ' "INITIALS?" ' "ALTNAME?" ' "STD
   CODE?" ' "sp2 NUMBER?"
60 P."sp3 HOUSE?" ' "sp2 STREET?" ' "sp4 TOWN?"
   "sp2 COUNTY?" ' "POSTCODE?"
70 P." sp3 NOTES?"
80 INPUT $M
90 IF $M=".END" P."TERMINATED!"; END
100 IF $M=".CLR" GOTOk
110 IF $M=".DSP" GOTOj
120 R=0
130 FOR Q=£8049 TO £81A9 STEP £20
140 R=R+1
150 IF Q=£8149 R=R-1
160 IF !Q<>£20202020 GOTOb
170 NEXT Q
180 P.$12,'''''''FAULT - INPUT STRING NOT IN"
   "CORRECT POSITION"
190 FOR Q=1 TO 250; WAIT; N.
200 GOTOa
210 bP.$12,'''''''INPUT ACCEPTED"
220 INPUT"NEW PAGE", $N
230 IF CH$N<>£59 A=£8200; G.d
240 h?£EI=0
250 F=FIN""
260 FOR G=£8200 TO £8BFE
270 ?G=BGET F
280 IF ?G=£23 G?1=BGET F; G.c
290 NEXT G
300 P."FAULT - EOP MARKER NOT FOUND"; END
310 cP."HIGHEST MEMORY LOCATION" ' "ON THIS
   PAGE=£",&G+1

```


SOFTWARE

PROGRAM LISTING

```

320 P.$7; D0
330 !£8160 = £100F1413; !£8165 = £05100114
340 FOR Q = 1 TO 30; WAIT; N.
350 !£8160 = £20202020; !£8165 = £20202020
360 FOR Q = 1 TO 30; WAIT; N.
370 UNTIL ?$B001 < > £FF
380 A = £8200
390 dIF $A = "E0P£" OR $A = ".LDT" G.a
400 W = A
410 IF R = 1 GOTOg
420 FOR Q = 1 TO R - 1
430 A = A + LEN(A) + 1
440 NEXT Q
450 gIF $M = $A OR $M = ".ALL" G.g
460 DO
470 A = A + LEN(A) + 1
480 UNTIL $A = "EOR + "
490 B = A + LEN(A) + 1
500 IF $B = ".LDT" B = B + LEN(B) + 1; ?£81FF = £2A
510 IF $B = "E0P£" GOTOi
520 A = A + LEN(A) + 1; GOTOd
530 jPRINT' "NOT ON THIS PAGE"
540 FOR Q = 1 TO 150; WAIT; N.
550 PRINT $12' " " "LOAD NEXT PAGE"
560 INPUT $N
570 IF CH$N < > £59 GOTOa
580 GOTOh
590 gA = W
600 PRINT $12"sp9 TELEPHONE LIST" ' "sp11 DATA OUT-
    PUT"
610 $N = "SURNAME";GOSUBf
620 $N = "INITIALS";GOSUBf
630 $N = "ALTNAME";GOSUBf
640 $N = "STD CODE";GOSUBf
650 $N = "NUMBER";GOSUBf
660 $N = "HOUSE";GOSUBf
670 $N = "STREET";GOSUBf
680 $N = "TOWN";GOSUBf
690 $N = "COUNTY";GOSUBf
700 $N = "POSTCODE";GOSUBf
710 $N = "NOTES";GOSUBf
720 T = 1
730 FOR J = 4 TO 1 STEP - 1
740 K = W/T%£10
750 IF K < £A K = K + £39
760 J?£81FA = K - 9; T = T* £10; N.J
770 ?£81F8 = £0D; ?£81F9 = £3D; ?£81FA = £23
780 P.' "CORRECT"
790 INPUT $N
800 IF CH$N < > £59 A = A + LEN(A) + 1; GOTOd
810 P."ANOTHER SEARCH"
820 INPUT $N
830 IF CH$N = £59 GOTOa
840 PRINT"TERMINATED!"
850 END
860 f PRINT' $N,$A
870 A = A + LEN(A) + 1
880 RETURN
890 kP.$21; P = £2800
900 !£A0 = £008C8200
910 [ \ CLEAR MEMORY 8200 - 8BFF
920 :LLO LDX £A2; LDY £A3; TYA
930 :LL1 STA($A0),Y; INY
940 BNE LL1; INC £A1; CPX £A1
950 BNE LL1; RTS
960 ]
970 LINK LL0
980 P.$6; GOTOa
990 jP.$12
1000 FOR C = £200 TO £A00 STEP £200
1010 FOR D = £8000 TO £81FF
1020 E = C?D
1030 IF E < £80 E = E:£60

```

```

1040 E = E - £20; ?D = E
1050 NEXT D
1060 DO UNTIL ?£B001 < > ?£FF
1070 NEXT C; GOTOa
END

```

TELEAMM PROGRAM LISTING

```

10 DIM N(9); @ = 0
20 cQ = 0
30 IF W > G + 1 P.$7"OUTSIDE PAGE"; W = £8200; FOR
    J = 1TO150;WAIT;N.
40 DO; W = W + Q
50 P.$12' ' ' $W' "M = "&W' "ALTER THIS STRING"
60 IF $W = "E0P£" P.' "END OF PAGE!"; W = £8200; END
70 INPUT $N
80 IF $N = ".END" P."TERMINATED!"; W = £2800; END
90 IF $N = ".MVE" IN."RECORD ADDRESS",W; GOTOc
100 IF $N".LDT" GOTOd
110 IF $N = ".DSP" GOTOe
120 Q = LEN(W) + 1
130 UNTIL CH$N = £59
140 M = £2800
150 INPUT"REPLACEMENT STRING",$M
160 D = LEN(M) - LEN(W)
170 IF G + 1 + D > £8BFF P."MEMORY EXCEEDED";
    W = £8200; GOTOb
180 IF D = 0 GOTOa
190 IF D > 0 X = G + 1; Y = W + LEN(W) + 1; Z = - 1
200 IF D < 0 X = W + LEN(W) + 1; Y = G + 1; Z = + 1
210 FOR L = X TO Y STEP Z
220 D?L = ?L
230 NEXT L
240 a$W = $M
250 iNPUT"LOAD TAPE",$N
260 IF CH$N < > £59 GOTOb
270 dF = FOUT" "
280 FOR L = £8200 TO G + 1 + D
290 BPUT F,?L
300 NEXT L
310 P.$7; DO
320 !£8140 = £100F1413; !£8145 = £05100114; FOR J = 1TO30;
    WAIT; N.
330 !£8140 = £20202020; !£8145 = £20202020; FOR J = 1TO30;
    WAIT; N.
340 UNTIL ?£B001 < > £FF
350 bINPUT"MORE CHANGES"$N
360 IF CH$N = £59 IN."RECORD ADDRESS", W; GOTOc
370 PRINT"TERMINATED!"; END
380 gFOR C = £200 TO £A00 STEP £200
390 FOR D = £8000 TO £81FF
400 E = C?D
410 IF E < £80 E = E:£60
420 E = E - £20
430 ?D = E
440 NEXT D
450 DO UNTIL ?£B001 < > £FF
460 NEXT C
470 GOTOc
END

```





**SYMBOL
SHIFT**

M PAUSE

N **NEXT**

B *** BORDER**



CONT ?

£ CLEAR

COPY

ST



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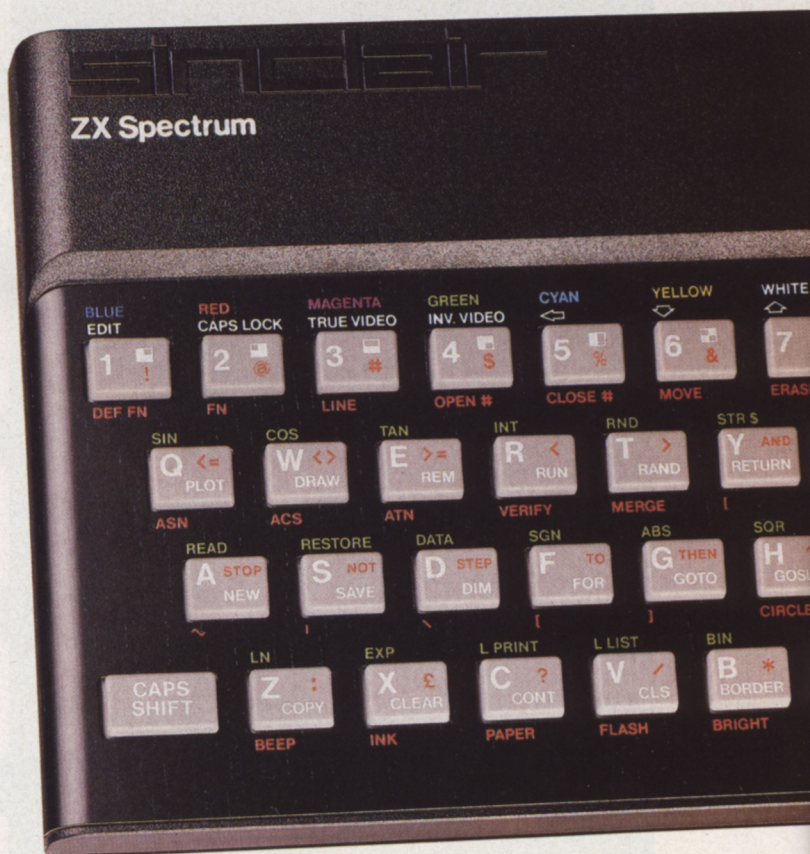
You have access to a range of 8 colours for foreground, background and border, together with a sound generator and high-resolution graphics.

You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.



Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

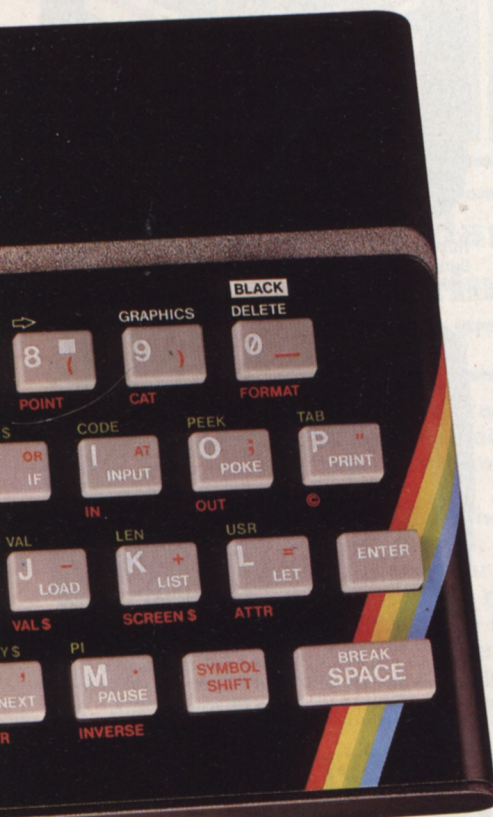
There's no need to stop there. The ZX Printer—available now—is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.



Key features of the Sinclair ZX Spectrum

- Full colour—8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound—BEEP command with variable pitch and duration.
- Massive RAM—16K or 48K.
- Full-size moving-key keyboard—all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution—256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set—with upper- and lower-case characters.
- Teletext-compatible—user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE—16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC—incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

um



RS232 /network interface board

This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

ZX Spectrum

Available only
by mail order
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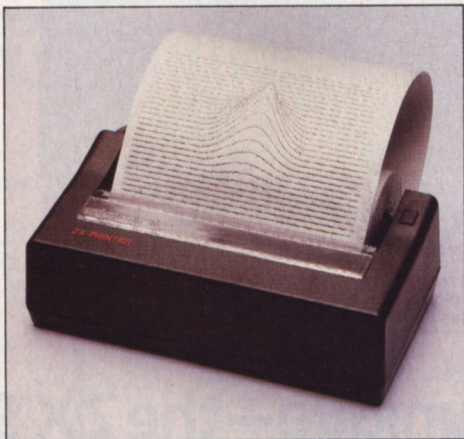
Sinclair Research Ltd,
Stanhope Road, Camberley,
Surrey, GU15 3PS.
Tel: Camberley (0276) 685311.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.



The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

The transfer rate is 16K bytes per second, with average access time of 3.5 seconds. And you'll be able to connect up to 8 ZX Microdrives to your ZX Spectrum.

All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.



How to order your ZX Spectrum

BY PHONE – Access, Barclaycard or Trustcard holders can call 01-200 0200 for personal attention 24 hours a day, every day. BY FREEPOST – use the no-stamp needed coupon below. You can pay by cheque, postal order, Barclaycard,

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ZX Spectrum software: how good and how soon?

The ZX Spectrum uses an enhanced version of Sinclair BASIC, fast becoming a world standard, and unlikely to be superseded. Unique features, such as one-touch keyword entry and syntax check and report, are increasingly attracting software originators.

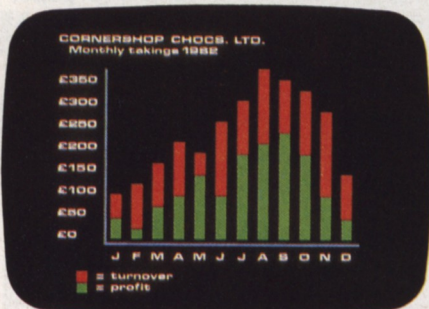
Building the software library is already far advanced, and a complete catalogue will be available in the next few months. Subjects will include sophisticated games, education, 'housekeeping', and business management. The more complex packages can, of course, be used to their best advantage with the full 48K RAM version of the ZX Spectrum.



The Sinclair ZX Spectrum can handle sophisticated games programs with high-resolution colour graphics and sound.



This major advance in computer technology maintains Britain's world-beating position in the field of personal computers.



A range of business software will soon be available, covering both specific applications (eg stock-control and payroll) and general business management systems (eg matrix models).



This second generation of Sinclair personal computers demonstrates continuing commitment. Advanced technology made the ZX80/81 family a price breakthrough: advanced technology makes the ZX Spectrum a breakthrough in price and performance.

Elegant, effective, unique—the ZX Spectrum design.

'Less than half the price of its nearest competitor – and more powerful.'

'These two pictures show how it's done. On the right is the PCB from the BBC Model A Microcomputer. On the left is the PCB from the ZX Spectrum.

It's obvious at a glance that the design of the Spectrum is more elegant.

What may not be so obvious is that it also provides more power.

'The ZX Spectrum has more usable RAM, and higher maximum RAM.

'It offers twice as many colours on the screen at any one time, plus a colour brightness control. It also offers user-definable graphics.

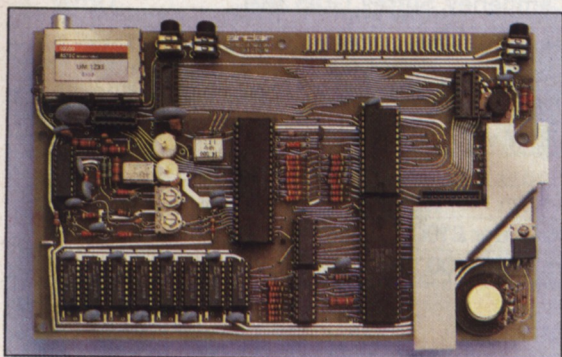
'It has data transfer rate 25% faster,

supported by a VERIFY facility.

'And it employs a dialect of BASIC (Sinclair BASIC) already in use in over 500,000 computers worldwide.

'We believe the BBC make the world's best TV programmes – and that Sinclair make the world's best computers!'

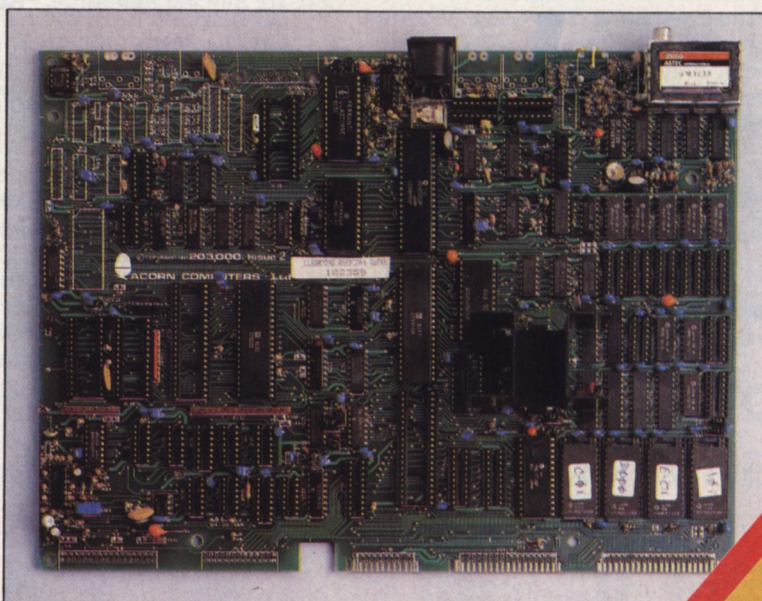
—Clive Sinclair.



Above left: internal layout of Sinclair ZX Spectrum.

Right: Internal layout of BBC Micro Model A.

The illustrations are to the same scale, and demonstrate the rate of advance in microcomputer design. The ZX Spectrum uses just 14 chips to provide more power and more user-available RAM.



sinclair ZX Spectrum

BLIND MAZE

Explore the dark depths of your TI 99/4A with this labyrinth game from Mike O'Regan.

In Blind Maze, the program draws a labyrinth on screen with random clumps of bushes and a random exit point. The player has five seconds to try and memorize the layout of the maze, after which the bushes and exit point disappear. The player then starts a timed run through the (invisible) maze to the exit point. Any contact with the maze bushes is signalled audibly and visually and subject to a time penalty.

The player's path is traced by a dotted line and, on completion of the run, the whole maze becomes visible once more, along with the path taken and the time for the run compared with the 'best time so far'. At this point you can choose to play again, if you can stand the frustration, with the same maze layout or a new one.

At the beginning of each game, you may choose to play with the displayed maze or, if you want a

sterner test, with a completely invisible one. There is also a facility for the user to increase or decrease the complexity of the

maze. User instructions are contained within the program, which is written in standard TI BASIC.

HOW IT RUNS

Lines	100	-	140	Clears screen and sets colours
Lines	150	-	530	Prints up title screen and instructions
Lines	540	-	680	Defines walls and man
Line	690			Seeds random number generator
Lines	700	-	860	Sets up maze
Lines	870	-	1170	Prints maze
Lines	1180	-	1240	Sets up start position
Lines	1250	-	1560	Scans keyboard and moves man accordingly
Lines	1570	-	1730	Checks to see if man has crashed into wall and implements crash routine
Lines	1740	-	1820	Routine to print messages on the screen
Lines	1830	-	1900	Flashes the screen
Lines	1910	-	2440	Prints winning messages and restarts the game

HINTS ON CONVERSION

Although the Texas has a fairly standard BASIC, which means the program will convert to other machines, it does have some very particular screen commands that are unique to itself. These commands are prefaced by CALL in the listings. The first two you meet are CALL CLEAR and CALL SCREEN. The first command clears the screen area and will usually be replaced by CLS on another machine. The second command changes the colour of the screen background and could be replaced with a command such as PAPER or SETCOLOR.

The CALL COLOR command is used to determine the actual foreground and background colour of the individual characters. The first argument in the statement specifies the character set to which that colour is assigned. CALL HCHAR and CALL VCHAR are used to place a character horizontally or vertically on the screen and repeat it in that direction. The first two arguments are the row and column numbers, the third is the character code and the fourth is the number of times it has to be repeated. These can be simulated on other machines by either a PRINT AT statement within a loop or a POKE to the screen.

Two other CALL statements used in the program are CALL CHAR and CALL SOUND. The CALL CHAR command on the

Texas allows the programmer to define his own custom characters. Although this can be implemented on other machines that have this facility, the method in which the information is presented to the computer does need further explanation. Other machines present the information in the form of 8 bytes which represent the 8 rows of dots that make up the character (for further information on this see the Spectrum feature in this issue). The Texas however divides the character into 8 rows, each containing two blocks of four dots each. The possible dot positions in these blocks are represented in hexadecimal, from 0 to F. This data is then placed into the CALL CHAR statement from left to right down the character, alternating the blocks. If you are converting this program to your own computer then it would probably be easier to define your own character for the man and the walls.

The CALL SOUND statement is, as the name suggests, used to generate the sound in the program. As with the defined graphics it would probably be easier to create your own sounds using your machines facilities. Finally the CALL KEY command is used to get a character from the keyboard and can be replaced with either GET or INKEY.

PROGRAM LISTING

100	CALL CLEAR	810	NEXT J
110	CALL SCREEN(5)	820	NEXT I
120	FOR QQ=1 TO 9	830	M(4,2)=96
130	CALL COLOR(QQ,16,5)	840	RANDOMIZE
140	NEXT QQ	850	RR=INT(RND*14)+4
150	M\$="BLIND MAZE"	860	M(RR,31)=129
160	Z=3	870	CALL CLEAR
170	GOSUB 1750	880	T=0
180	M\$="*****"	890	REM PRINT COURSE
190	Z=4	900	CALL HCHAR(3,1,112,544)
200	GOSUB 1750	910	CALL HCHAR(3,1,105,32)
210	M\$="BY MIKE O'REGAN"	920	CALL VCHAR(4,32,105,16)
220	Z=5	930	CALL HCHAR(20,1,105,32)
230	GOSUB 1750	940	CALL VCHAR(4,1,105,16)
240	M\$="*****"	950	FOR I=4 TO 19
250	Z=6	960	FOR J=2 TO 31
260	GOSUB 1750	970	C=M(I,J)
270	M\$="YOU HAVE 5 SECONDS"	980	CALL HCHAR(I,J,C)
280	Z=8	990	NEXT J
290	GOSUB 1750	1000	NEXT I
300	M\$="TO MEMORIZE THE MAZE"	1010	FOR PSE=1 TO 1200
310	Z=9	1020	NEXT PSE
320	GOSUB 1750	1030	CALL COLOR(13,12,12)
330	M\$="THEN YOU MUST TRY TO FIND"	1040	N=48
340	Z=10	1050	N2=48
350	GOSUB 1750	1060	N3=48
360	M\$="THE FINISH IN THE LEAST TIME"	1070	N1=48
370	Z=11	1080	M\$="PRESS 'B' FOR A BLIND MAZE."
380	GOSUB 1750	1090	Z=22
390	M\$="IF YOU HIT THE MAZE, THEN"	1100	GOSUB 1750
400	Z=13	1110	CALL KEY(O,K,S)
410	GOSUB 1750	1120	IF S<1 THEN 1110
420	M\$="5 PENALTY POINTS ARE ADDED"	1130	IF K<>66 THEN 1180
430	Z=14	1140	M\$="HANG ON!"
440	GOSUB 1750	1150	Z=23
450	M\$="USE ALL ARROW KEYS"	1160	GOSUB 1750
460	Z=16	1170	GOTO 690
470	GOSUB 1750	1180	CALL SOUND(100,880,2)
480	M\$="HANG ON FOR 1 MINUTE"	1190	REM SET MAN'S START POSITION
490	Z=20	1200	X=2
500	GOSUB 1750	1210	Y=4
510	M\$="WHILE I SORT OUT A NEW MAZE"	1220	J=2
520	Z=21	1230	I=4
530	GOSUB 1750	1240	CALL HCHAR(I,J,96)
540	CALL HCHAR(1,1,30,32)	1250	REM MOVE MAN
550	CALL VCHAR(2,1,30,24)	1260	CALL KEY(0,KEY,STATUS)
560	CALL HCHAR(24,2,30,32)	1270	N=N+1
570	CALL VCHAR(1,32,30,24)	1280	IF STATUS=0 THEN 1260
580	REM DEFINE WALLS, MAN	1290	IF KEY<>88 THEN 1320
590	CALL CHAR(96,"995A3C3C3C3C2424")	1300	I=Y+1
600	CALL CHAR(128,"CCCC3333CCCC3333")	1310	GOTO 1580
610	CALL CHAR(129,"181818FF18181818")	1320	IF KEY<>69 THEN 1350
620	CALL CHAR(97,"0000003C3C3C")	1330	I=Y-1
630	CALL CHAR(105,"FFFFFFFFFFFFFFFF")	1340	GOTO 1580
640	CALL CHAR(112,"0")	1350	IF KEY<>83 THEN 1390
650	CALL COLOR(9,2,12)	1360	J=X-1
660	CALL COLOR(11,12,12)	1370	CALL VCHAR(1,1,N3)
670	CALL COLOR(13,13,2)	1380	GOTO 1580
680	CALL COLOR(10,5,12)	1390	IF KEY<>68 THEN 1410
690	RANDOMIZE	1400	J=X+1
700	REM ARRAY TO SET UP COURSE, CHANGE D	1410	IF KEY<>87 THEN 1450
	TO MAKE COURSE EASIER OR HARDER	1420	J=X-1
710	D=1.18	1430	I=Y-1
720	DIM M(20,32)	1440	GOTO 1580
730	FOR I=4 TO 19	1450	IF KEY<>82 THEN 1490
740	TM=0	1460	J=X+1
750	FOR J=2 TO 31	1470	I=Y-1
760	R1=INT(RND*D)	1480	GOTO 1580
770	IF R1=0 THEN 800	1490	IF KEY<>67 THEN 1530
780	M(I,J)=128	1500	J=X+1
790	GOTO 810	1510	I=Y+1
800	M(I,J)=112	1520	GOTO 1580

PROGRAM LISTING

1530	IF KEY < > 90 THEN 1570	2000	M\$ = "YOUR SCORE: "&STR\$(N)
1540	J = J - 1	2010	Z = 2
1550	I = Y + 1	2020	GOSUB 1750
1560	GOTO 1580	2030	M\$ = "
1570	REM CHECK FOR CRASH		"
1580	IF (J < 2) + (J > 31) + (I < 4) + (I > 19) + (M(I,J) = 128	2040	Z = 22
	THEN 1920	2050	V = 9
1590	CALL HCHAR(Y,X,97)	2060	GOSUB 1750
1600	CALL HCHAR(I,J,96)	2070	CALL SOUND(200,370,4,440,4,294,4)
1610	IF M(I,J) = 129 THEN 1920	2080	CALL SOUND(600,392,3,494,3,294,3)
1620	X = J	2090	CALL SOUND(200,392,2,494,2,294,2)
1630	Y = I	2100	CALL SOUND(800,294,1,440,1,370,1)
1640	GOTO 1260	2110	M\$ = "CONGRATULATIONS!"
1650	REM CRASH ROUTINE	2120	CALL COLOR(13,13,2)
1660	CALL SOUND(500,110,4, - 5,2)	2130	Z = 23
1670	CALL HCHAR(Y,X,106)	2140	GOSUB 1750
1680	GOSUB 1830	2150	M\$ = "PRESS Y TO PLAY AGAIN"
1690	CALL HCHAR(Y,X,96)	2160	Z = 24
1700	I = Y	2170	GOSUB 1750
1710	J = X	2180	CALL KEY(O,K,S)
1720	N = N + 5	2190	IF S = 0 THEN 2180
1730	GOTO 1240	2200	IF K < > 89 THEN 2360
1740	REM SUBROUTINE FOR PRINTING MESSAGES	2210	M\$ = PRESS Y FOR SAME SET-UP"
1750	V = 16 - INT(LEN(M\$)/2)	2220	Z = 23
1760	FOR I = 1 TO LEN(M\$)	2230	GOSUB 1750
1770	CD = ASC(SEG\$(M\$,I,1))	2240	CALL KEY(O,K,S)
1780	CALL HCHAR(Z,V + I,104)	2250	IF S = 0 THEN 2240
1790	CALL COLOR(10,2,16)	2260	TM = 0
1800	CALL HCHAR(Z,V + I,CD)	2270	IF K = 89 THEN 870
1810	NEXT I	2280	CALL CLEAR
1820	RETURN	2290	M\$ = "IT TAKES A LITTLE TIME TO"
1830	FOR I = 1 TO 3	2300	Z = 14
1840	CALL SCREEN(9)	2310	GOSUB 1750
1850	CALL SCREEN(10)	2320	M\$ = "SET-UP A NEW MAZE."
1860	CALL SCREEN(10)	2330	Z = 15
1870	NEXT I	2340	GOSUB 1750
1880	CALL CHAR(104,"0000001818")	2350	GOTO 690
1890	CALL SCREEN(4)	2360	M\$ = "
1900	RETURN		"
1910	REM WINNING ROUTINE	2370	Z = 23
1920	M\$ = "YOU MADE IT!!!"	2380	GOSUB 1750
1930	IF BTM = 0 THEN 1940 ELSE 1960	2390	Z = 24
1940	BTM = N	2400	GOSUB 1750
1950	GOTO 1970	2410	M\$ = "THANKS FOR THE GAME."
1960	IF BTM < N THEN 1970 ELSE 1940	2420	Z = 22
1970	M\$ = "BEST SO FAR: "&STR\$(BTM)	2430	GOSUB 1750
1980	Z = 1	2440	END
1990	GOSUB 1750		





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from the ZX Software review in Your Computer, May '82 issue.

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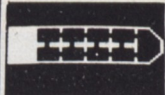
Cassette Two contains Reversi, Awari, Laser Bases, Word Mastermind, Rectangles, Crash, Roulette, Pontoon, Penny Shoot and Gun Command.

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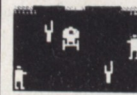
8 games for 16k

ZX-SCRAMBLE (machine code)

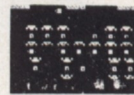


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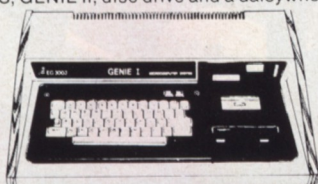
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USING ATOM WITH BBC BASIC

As everyone knows, the dialect of BASIC supplied with Acorn's popular Atom computer is very idiosyncratic. So it seems a sensible idea to fit the machine with the much nicer BASIC of the new BBC Microcomputer. Not surprisingly, a converted Atom is a poor relation to BBC Micro so it seems useful to conduct this review from the point of view of seeing how a converted Atom compares with both a BBC Micro and a standard Atom. That way, Atom owners should be able to decide whether they should go out and buy a full BBC Micro, or make do with the new board for their Atoms.

BBC BASIC is supplied on a small 16cm by 9cm printed circuit board which sits on top of the main PCB of the Atom. It is fitted by removing three chips from the Atom board, and then carefully slotting the little legs of the BBC board into the sockets that are now vacated. The Atom I was supplied with already had this modification carried out, so I cannot comment on its simplicity or complexity. It appears though, that dealers will carry out the necessary modifications for the faint of heart. Once the board has been fitted, the user can select either BASIC by the use of a simple switch, but my model had an optional three wire circuit fitted which allowed me to select the BASIC I wished to use from the keyboard. As the documentation I was supplied with was **very** provisional I cannot say whether the board is compatible with the many IC's which fit

into the A000 socket on the Atom's main board.

For the curious, the board contains 2K of RAM, 20K of ROM in the form of a 16K BASIC ROM and a 4K operating system ROM, two empty 4K ROM sockets and nine assorted TTL chips. As the review progresses you will appreciate the need for all that circuitry.

The Atom I was supplied with was an Issue Five machine. The Atom in either BASIC is so slow in reading the keyboard, a touchtypist like myself has no difficulty in defeating the machine, and so losing keypresses in the process. The video section also appears to be improved, certainly there is none of the rolling that characterizes my Atom on some televisions.

Having fitted the BBC board, the machine powers up perfectly normally, that is, you have to press 'BREAK' before you can get the machine to do anything sensible. However, if you keep 'CONTROL' pressed whilst doing a 'BREAK', instead of the familiar 'ACORN ATOM' prompt appearing you get the prompt 'BBC BASIC'. Any further depressions of the 'BREAK' key will keep you in BBC BASIC. To return to Atom BASIC, you press 'SHIFT' and 'BREAK' together.

Initial experiments led me to believe that it was possible to have both a BBC BASIC program and an Atom BASIC program in the machine at the same time. Later experience showed that this is only possible if the BBC BASIC program is shorter than 256 bytes long,

which is a pity. It is also impossible to change languages half way through a program, which is not very surprising when you consider that the two languages use completely different methods for storing programs.

I was unable to load BBC BASIC programs from my BBC Micro into the Atom when it was running BBC BASIC. I presume this is a hardware fault and that it is normally possible if not the whole product loses much of its appeal.

The table below shows how the three BASIC's under test performed the standard benchmark programs:

In all cases, I inserted lines to read and set the internal timer of BBC BASIC to carry out the timings on the two BBC BASIC machines.

Notice that the Atom under BBC BASIC runs approximately half as fast as a real BBC Micro. This is because the 6502 in the BBC Micro is run at 2 MHz, whilst the 6502 in the Atom only operates at 1 MHz.

The notable features of BBC BASIC for the owner of an Acorn Atom are that it is Microsoft BASIC compatible, that it is 'structured', so that one can do away with statements such as 'FIF', 'FINPUT', 'FPRINT' and 'FDIM' which are present in Atom Basic. The BASIC is also fast, comprehensive and gives you error messages in English which is preferable to being presented with just an error code.

A list of available statements and functions appears in Table II. Some of the interesting ones are:



Benchmark timings to nearest tenth of a second

Language	B1	B2	B3	B4	B5	B6	B7	B8
BBC BASIC on BBC Micro (Integer)	0.2	1.7	7.5	7.7	8.1	10.3	14.9	4.9
BBC BASIC ON BBC Micro (Real)	0.7	2.8	8.0	8.5	8.9	13.8	21.3	4.9
BBC BASIC on Atom (Integer)	0.5	3.3	14.3	14.6	15.4	19.5	28.2	9.2
BBC BASIC on Atom (Real)	1.2	5.4	15.2	16.1	16.9	26.1	40.5	9.3
Atom BASIC (Integer)	0.8	5.5	10.0	11.5	14.5	20.0	31.5	-
Atom BASIC (Real)	-	-	30.5	27.0	30.0	-	-	26.0

AUTO: which automatically presents the programmer with line numbers as a program is typed in.

CALL: which is an extended form of the LINK statement of Atom BASIC. It allows any number of parameters to be passed to a machine code program.

CHAIN: loads and runs a named program from cassette. No more '*RUN' commands.

READ, DATA and RESTORE: which should be welcomed with open arms by Atom owners up and down the country.

DEF: This statement allows the definition of procedures and functions.

DELETE: This deletes a range of program lines.

DIV: an integer division

ATOM/BBC

REVIEW

operator — it is considerably faster than using the normal '/'.

ELSE: This is an indispensable adjunct to the standard 'IF' statement. Notice however that the IF-THEN-ELSE of BBC BASIC is not global. This means all parts of the construction must appear on the same physical program line. Full error handling is provided, via the ONERROR statement, so doing away with the indirection operators used for this purpose in Atom BASIC.

GET, GETS and the variations of INKEY will remove the need for calls to &FFE3, often found in Atom BASIC programs thus making the process of scanning the keyboard for a key-press a lot simpler and easier to manipulate.

PAGE: This removes the need to alter location 18, in order to move around programs in memory.

The new RND statement of BBC BASIC can produce random numbers in a specific range, not just $\pm 200,000,000$.

The SOUND statement, while considerably less versatile than the BBC computer's SOUND statement allows notes to be sounded on the internal speaker, of specified frequency and duration.

TIME is a real time clock, counting in hundredths of a second. It appears the Atom's optional VIA must be fitted for this to work.

All the statements you know and love from Atom BASIC are still present, although they are sometimes known by different names.

People with ZX computers and the like will not be able to understand the glee of Atom owners when they discover that this module gives them 'proper' string handling.

Some of the more useful statements from BBC BASIC have, however, not been implemented. Specifically, none of the colour statements, GCOL and COLOUR, are supported, POINT for graphics work is absent and (not surprisingly) ENVELOPE and ADVAL are nowhere to be seen. From studying the documentation it would appear that Acorn made only a half hearted attempt to improve the graphics of the Atom, since none of the useful triangle drawing statements are present. Also it is not possible to mix text and graphics, along with any number of other disadvantages.

Atom owners who switch between the two languages regularly are in for a difficult time. For example in Atom BASIC, hexadecimal numbers are indicated by a hash symbol.

When you progress to BBC BASIC, you have to remember that the hash is used in the assembler, for immediate mode instructions, instead of the Atom's '@' symbol. For hex numbers you must now use '&'. However, in Atom BASIC this means "PRINT THE NEXT NUMBER IN HEX". All this can get very confusing.

The memory map of the Atom alters dramatically under BBC BASIC which will also cause a few problems. I was only supplied with provisional documentation, as mentioned previously, but I did manage to discover things like the screen is now mapped to &4000 (hex number), memory mapped input output is now situated at 28K and programs start at 2K. All of this makes BBC BASIC on the Atom effectively incompatible with the BBC machine for any programs which:

a) Use the screen, since the screen format is different, and the screen of the two machines are in different places in the memory map.

b) Use the area from &DOO to &DFF in the BBC machine for machine code storage, since this is

now in the middle of the user program.

c) Use any of the cassette commands, since there is no buffered output on the Atom.

d) Use the MOS commands such as *FX, since these simply do not exist on the Atom.

The documentation I was supplied with consisted of 28 pages of photo copied A4. The first 20 pages consisted of brief descriptions of each keyword.

Next came a couple of pages detailing the operators and symbols used in BBC BASIC. While this was complete, there were no examples, so an Atom owner will be safe in the knowledge that ^ indicates a hex number in a print statement, he may well still be baffled, since that is the only information supplied. A half page tells you which variable names are legal, and the order of priority when expressions are worked out. Next comes an (incomplete) list of error messages.

The rest of the manual is taken up with a technical description of the operating system calls and the assembler.



Users of the BBC computer will be familiar with the VDU drivers. These software modules provide access to many of the machine's more advanced facilities. Many of these do not exist when you use the Atom's operating system, but, more annoyingly, many of those that are present are not documented.

The manual finishes with four example programs: Lissajous figures (two varieties), the C-curve and the tower of hanoi problem.

After studying the manual closely again for the purposes of this review, a sickening feeling gripped me. Perhaps this is the final manual after all, and not a provisional one at all? If this is so, I can only hope that prospective purchasers will also be provided with the BBC Micro's 'User Guide' as well, for more detailed documentation. If not, this is the worst example of the art of documentation ever.

To sum up, if your interest lies in games or graphics, you should not consider the BBC BASIC for the Atom, otherwise it is an invaluable product, and I would recommend it unreservedly.

B1

```
10 FOR K=1 TO 1000
20 NEXT K
```

B2

```
120 K=0
130 K=K+1
140 IF K<1000 THEN 130
```

B3

```
210 K=0
220 K=K+1
230 A=K/K*K+K-K
240 IF K<1000 THEN 220
```

B4

```
310 K=0
320 K=K+1
330 A=K/2*3+4-5
340 IF K<1000 THEN 320
```

B5

```
410 K=0
420 K=K+1
430 A=K/2*3+4-5
440 GOSUB 2000
450 IF K<1000 THEN 420
```

B6

```
520 K=0
530 DIM M(5)
540 K=K+1
550 A=K/2*3+4-5
560 GOSUB 2000
570 FOR L=1 TO 5
580 NEXT L
590 IF K<1000 THEN 540
```

B7

```
660 K=0
670 DIM M(5)
680 K=K+1
690 A=K/2*3+4-5
700 GOSUB 2000
710 FOR L=1 TO 5
720 M(L)=A
730 NEXT L
740 IF K<1000 THEN 680
```

B8

```
810 K=0
820 K=K+1
830 A=K^2
840 B=LN(K)
850 C=SIN(K)
860 IF K<1000 THEN 820
2000 RETURN
```

TABLE II
BBC BASIC for the Atom Keywords

ABS	ACS	AND	ASC
ASN	ATN	AUTO	BGET
BPUT	CALL	CHAIN	CHR\$
CLEAR	CLOSE	CLG	CLS
COS	COUNT	DATA	DEF
DEG	DELETE	DIM	DIV
DRAW	ELSE	END	ENDPROC
EOR	ERL	ERR	ONERROR
EVAL	EXP	FALSE	FN
FOR	GET	GET\$	GOTO
GOSUB	HIMEM	IF	INKEY
INKEY\$	INPUT	INPUT	INSTR
		LINE	
INT	LEFT\$	LEN	LET
LIST	LISTO	LN	LOAD
LOCAL	LOG	LOMEM	MID\$
MOD	MODE	MOVE	NEW
NEXT	NOT	OFF	OLD
ON	OPENIN	OPENOUT	OPT
OR	PAGE	PI	PLOT
PRINT	PROC	RAD	READ
REM	RENU	REPEAT	REPORT
	MBER		
RESTORE	RETURN	RIGHT\$	RND
RUN	SAVE	SGN	SIN
SOUND	SPC	SQR	STEP
STOP	STR\$	STRINGS	TAB
TAN	THEN	TIME	TOP
TO	TRACE	TRUE	UNTIL
USR	VAL	VDU	WIDTH





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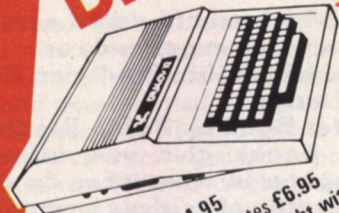
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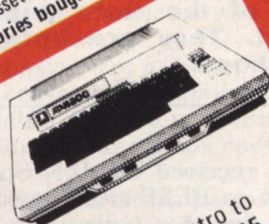
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The Computer Book by Robin Bradbeer, Peter De Bono and Peter Laurie.

Personal Computer Book by Robin Bradbeer.

Both these books give you information about what a computer is, what it can do and how it works. The latter title also gives a run down on some of the more popular machines on the market. They are both available from good bookshops.

Sirs

Having received my 16K Spectrum and found how to make it go BEEP etc, I typed in some ZX81 programs, only to find that (unless extremely simple) they do not work!

I think this is because the character codes have been changed to ASC11. Is this true? And if so, how can I convert them? (i.e. CHR\$(CODE 33).

Also do PEEK and POKE have to be altered?

These questions will affect a great many people so please try to answer.

Like the mag, by the way.

Thanks.

G Kennedy
St. Leonards-on-Sea

You are partially right in saying that the Spectrum codes have been changed to ASCII. The character codes do conform to ASCII from 32 to 96 although there are some standard ones outside this range e.g. CHR\$(13), which still stands for ENTER or RETURN.

There is no easy way to convert between the two values so perhaps the easiest and safest method is to acquire a ZX81 manual, check the meaning of the ZX81 codes in the program and look up their equivalents in appendix A of the Spectrum manual.

As for PEEK and POKE, you have a problem. The Spectrum screen is not constructed in the same way as the '81 screen. The difference in the way that character information is displayed is so great that PEEKing and POKEing are virtually impossible. The alternative is to use the PRINT AT command instead of POKE and the SCREEN command instead of PEEK.

Dear PCT

Are the game cartridges used with the Atari Video Computer System compatible with the Atari 400 or 800 computers? What about the VCS joysticks?

G Nunn

Gillingham

The answer, I'm afraid is no. The two systems are completely incompatible. It is worth pointing out that the games cartridges that are available for the Atari computers are of a much higher standard and usually offer the player a lot more choice as to the configuration of the game.

On a positive note, all the games controllers for the VCS can be used on the computers, as they all have standard connectors.

Dear Sir

My first of all welcome you into this hectic and strenuous market. Your magazine seems to contain much more than others, I came across it looking for another and now I'm glad it was on the rack. There are one or two questions I would like to ask:

I have a character generator program and have no idea how to use it or to display characters I've saved from it. When I complete the LOAD cycle, the VIC just acknowledged the fact that the character was in the memory. How can I now use them.

I connect the VIC expansion slot to a memory box on the table, by means of a cable or such similar thing. I have seen ads for Ribbon cable – can a user connect a 24 way cable to the expansion port and a box containing cartridges and other things.

I would like to expand RAM as cheaply as possible. So what's the possibility of more memory?

Robin Bohd

Whitchurch

The best way to check whether the characters are in memory or not is to change the value in the register which holds the address of the character ROM. On the VIC this is location 36869. If you

change the value stored in this location by POKEing it with a new number then it will think that its character generator is in a different place, hopefully where you have just loaded your character set. The values to try in this location are 255, 254, 253, as this will change the pointer to the three locations in memory where the VIC can store an alternative character set.

When you do this, any characters on the screen will then either be displayed as garbage, meaning the characters aren't stored in this location, or they will appear as your user-defined characters, meaning that you have the right value. This will tell you if they are in the memory and what to do to switch the VIC to use your character set. If you can't locate the characters by this method then it means that they are not in memory, (or at least in a place where you can use them). If this is the case then its back to the drawing board and check to see whether or not the program which actually generates the characters is working properly.

Putting your expansion memory in a box and connecting it to the computer by a ribbon cable is not really a viable idea. This is because the longer the cable then the more likely it is that you will get interference on the data signals, causing your program to be corrupted, or, because the length of cable will slow the access speed of the computer down, meaning that it will not be able to properly read or write to the expansion memory, the machine will 'crash'. But if you want to try it you might be lucky and get away with it.

One of the most economical ways to expand the computer is to buy the Upgradable Ram Cartridge, made by STACK computers. You can buy this cartridge with different amounts of memory, starting at 3K and then at a later date if you want more memory, you can open up the case and plug more RAM chips into the sockets provided. So the cost of expansion is then governed by the cost of the ram chips, which can be bought from electronics suppliers.

PRIORITY REPLY

September 1982 Issue

Personal Computing Reader Enquiry Service

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Spectrum Software

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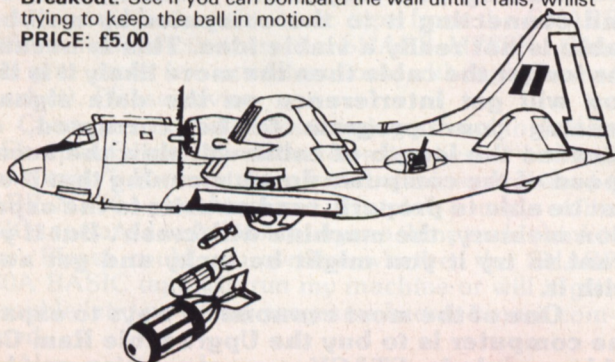
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ZX81 — Software

ZX VIDEO GAMES

This latest package of software to be released must surely be the most amazing available in the world. It features on one cassette all the fast action machine code games that other companies would sell for £5.00 each, but we are able to bring you *all* the following Machine Code Arcade games for that price. Not only are they excellent value for money but they are of the finest quality available for the ZX81. ZXVG contains:

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Wave after wave of sweeping invaders drop their bombs at you. Your only hope is to dodge and destroy them. This is a most addictive game, and we guarantee that this game will make your ZX81 really come to life.

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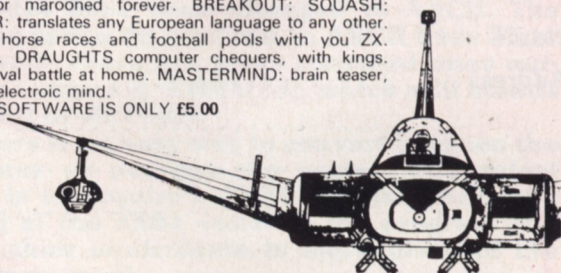
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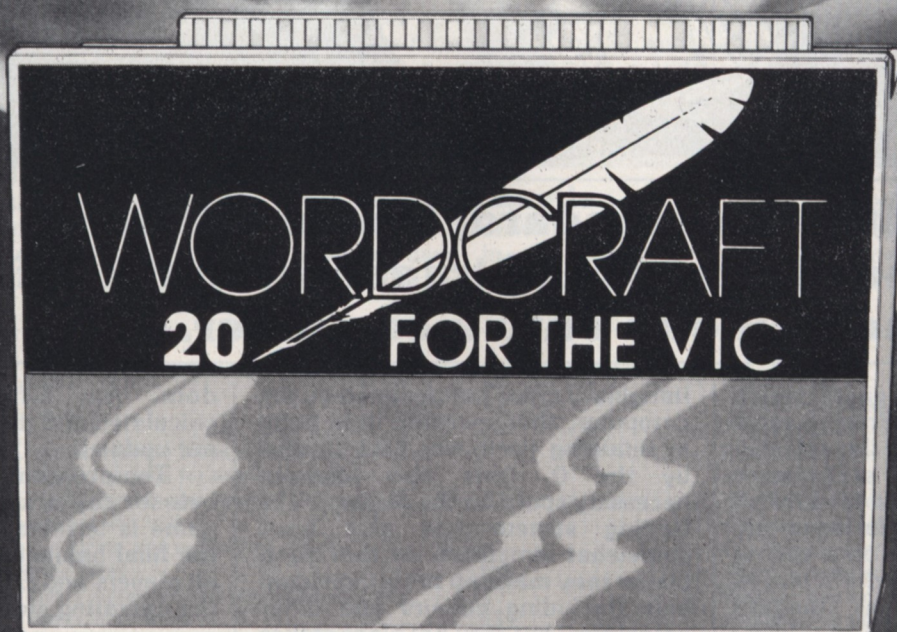
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A NEW ERA OF WORD PROCESSING



The introduction of Wordcraft 20 for the VIC brings the benefits and advantages of full scale word processing directly to the general public.

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Wordcraft 20: £125.00 inc. VAT and p&p. Available from all VIC dealers or direct from Audiogenic Ltd, PO Box 88, Reading, Berks. Tel: 0724 586334. Wordcraft 20 is copyright P.L. Dowson 1982.

DIGITAL ROULETTE



In this month's Gamesboard, Simon Williams explores the difficulties of transferring the infamous casino game Roulette onto a computer.

Roulette is a casino game which probably originated in France; some say it was invented by the scientist Blaise Pascal in the seventeenth century. It is now played in clubs all over the world and fortunes are reputedly won and lost on a spin of the wheel. Digital Roulette is played along the same lines as standard roulette.

The original idea of programming the game of Roulette for the TRS-80 Model I was to try to simulate the action of the wheel graphically on the display. The resolution available on the screen (128x48 graphics blocks) soon showed that it would be impossible to properly depict a 37 sided wheel in anything approaching a circular format. It was therefore decided to reproduce the board as accurately as possible and to convert the wheel into four columns of nine digits, down which a 'ball' could be made to travel in turn, stopping randomly at a selected number.

Having a green monitor with the TRS-80 on which I work, the colour categories for Digital Roulette were chosen to be green and black. Further variations concern the 0 character and the method of betting.

Since the game only involves

imaginary chips manipulated by the computer, there seemed little point in retaining the house bias created by the 0, (this also released necessary space on the display). The betting system has also been somewhat simplified, in that each player may make up to six individual bets (including colours and other categories) but may not place stakes on combinations of numbers.

Method Of Play

When the program is run, a title sequence is displayed, followed by a screen of basic instructions on play. The playing table and 'digital wheel' are then set up with the 'green' numbers underlined and the number of players with their names are requested in turn. Each player is allocated £100 in £10 chips and then asked to enter the amount and type of up to six separate bets. All inputs are checked and messages displayed if they are incorrect. At the end of each bet, the odds are given and the chips are graphically represented on the board.

After all players have placed their bets (a player may choose to miss a round by entering a bet amount of 0), the program will run the ball down the four columns and stop finally at one selected at ran-

dom. Any winnings are then calculated and the players' accounts are updated.

The program repeats by taking bets for the next round, unless the game is terminated, in which case the final balances are displayed for all players and control is returned to the operating system.

Program Divisions

Digital Roulette is written in Level II BASIC and takes approximately 9K of RAM. The programme is divided into nine sections as follows:

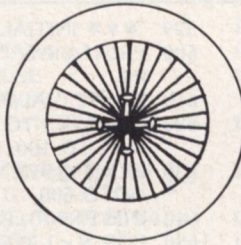
10 - 70	Title
200 - 280	Instructions
300 - 570	Draw board
600 - 710	Initialise
800 - 1080	Make bets
1200 - 1290	Run wheel
1400 - 1440	Assess winning number
1600 - 1710	Update players' accounts
1800 - 1890	Another spin?

Graphics Technique

The graphics used within the program are peculiar to the TRS-80 and Video Genie. They are used within the title sequence and to draw the roulette board and mark the players' bets.

For those who don't possess a TRS-80, each print location, of which there are 16 rows of 64 in the standard format, is looked on as a three by one rectangle for the purpose of graphic display. Each of these rectangles is subdivided into six, two by one blocks which may be addressed individually using the SET and RESET commands or the PRINT statement. There are 64 possible combinations of these blocks within each print location, and these are assigned the ASCII codes 128 to 191 for ease of manipulation within Level II BASIC. A diagram of these combinations and their codes is provided on page C/6 of the Tandy Level II BASIC manual (latest edition).

In the title sequence, each graphics block is read from a DATA line as the ASCII code and then converted via the CHR\$ statement. Each block is then PRINTed at the appropriate location (16 rows of 64 columns numbered consecutively 0 to 1023) to build up the title. Strings of graphics blocks are then built up by concatenating their ASCII codes and are PRINTed in sequence to the screen to create the illusion of move-



	LOW				ODD				RED				
0	3	6	9	12	15	18	21	24	27	30	33	36	T
	2	5	8	11	14	17	20	23	26	29	32	35	S
	1	4	7	10	13	16	19	22	25	28	31	34	F
	HIGH				EVEN				BLACK				

ment.

The other technique used to provide graphics within the program is the use of the SET and RESET commands. These statements make use of the same graphics blocks, but address each block individually on a screen of 48 by 128 locations. The columns are numbered 0 to 127 and rows from 0 to 47. The statement SET (32,24) will, therefore, turn on the graphics block 33 rows down and 25 columns in from the left.

Other Commands

There are three other TRS-80 statements used in the program which may require explanation.

CLS Clears the Screen and moves the cursor to the top left of the display. INKEY\$ performs a single scan of the keyboard, returning with a character if a key has been pressed, or a null string if not. The TAB modifier used in some of the PRINT statements acts much like a typewriter TABulator. The columns on a TRS-80 display are numbered 0 to 63 and the number enclosed within the brackets following the TAB statement is the number of the column in which the information will be printed. An apostrophe (') is a Level II BASIC abbreviation for the REM statement and is used in the program for titling sections.

List Of Variables

L,M,N,X,Y - General purpose loops and graphics
 A1\$ - A3\$, B1\$-B3\$ - Graphics strings for animated titles
 R1\$ - R4\$ - Graphics strings for rows of roulette numbers and ball
 P\$, P - Input string and number of players
 PN\$(N) - Name array
 PA(M,N) - Players' balances and bet amounts array
 PB\$(M,N) - Players' bets array
 B\$(M,N) - Look-up table of categories and odds
 A\$,A - Input string and amount of bet
 BA - Total amount of bet for each round (per player)
 C - Bet counter for each round (per player)
 CH - Check for 'all players out of funds'
 B\$,B - Input string and type of bet
 S - General purpose stake graphics

O\$ - Odds string
 S1 - General purpose stake graphics
 F\$ - "Further bets?" string
 R - Random number (number of cycles of roulette ball)
 R1 - Random number (1-36) for position of winning number
 W - Winning number
 W\$ - Winning number string
 T - Winning row on board
 T1\$ - Winning row comparison string
 T2\$ - Winning row high/low comparison string
 T3\$ - Winning row odd/even comparison string
 T4\$ - Winning row black/green comparison string
 PA - Player's stake
 PS - Player's balance
 PW - Player's winnings

PROGRAM LISTING

```

9  '*** TITLE
10 CLEAR 200: GOSUB 20: GOTO 170
20 CLS: PRINT@274,"DIGITAL": FOR M = 320 TO 512
   STEP 64
30 FOR N = 10 TO 54: READ D: PRINT@M + N,CHR$(D)::
   NEXT N,M
40 A1$ = CHR$(140) + CHR$(131) + CHR$(191) + CHR$(1
   31) + CHR$(140)
50 A2$ = CHR$(140) + CHR$(140) + CHR$(191) + CHR$(1
   40) + CHR$(140)
60 A3$ = CHR$(140) + CHR$(176) + CHR$(191) + CHR$(1
   76) + CHR$(140)
70 B1$ = CHR$(188) + CHR$(131) + CHR$(131) + CHR$(1
   31) + CHR$(188)

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80 B2$ = CHR$(128) + CHR$(179) + CHR$(140) + CHR$(1
   79) + CHR$(128)
90 B3$ = CHR$(143) + CHR$(176) + CHR$(176) + CHR$(1
   76) + CHR$(143)
100 FOR M = 1 TO 100 STEP 5: PRINT@403,A1$:
   PRINT@467,A2$:PRINT@531,A3$:
110 FOR N = 1 TO M: NEXT N: PRINT@403,
   B1$:PRINT@467,B2$: PRINT@531, B3$:
120 FOR N = 1 TO M: NEXT N,M: FOR N = 1 TO 500: NEXT:
   RETURN
130 DATA 191,131,131,131,131,140,176,32,32,32,32,32,
   32,32,32,32,32,32,32,32,32,32,191,32,32,32,32,
   32,32,32,140,191,140,191,140,32,32,32,32,32,32,32
140 DATA 191,176,176,176,176,140,131,32,176,140,
   131,131,131,140,176,32,191,32,32,32,32,191,32,

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191,32,176,140,131,131,131,140,176,32,191,32,191,
32,176,140,131,131,131,140,176
150 DATA 191,32,32,32,32,131,188,32,191,32,32,32,32,32,
191,32,191,32,32,32,32,191,32,191,32,191,140,140,
140,140,140,143,32,191,32,191,32,191,140,140,140,
140,140,143
160 DATA 191,32,32,32,32,191,32,131,140,176,176,
176,140,143,32,131,140,176,176,176,140,131,32,191,
32,131,140,176,176,176,140,131,32,191,32,191,
32,131,140,176,176,176,140,131
170 CLS: PRINT@468,"COPYRIGHT 1981, S.WILLIAMS":
FOR N=1 TO 1000: NEXT
199 '*** INSTRUCTIONS
200 CLS: PRINT@24,"DIGITAL ROULETTE"
210 FOR N=48 TO 79: SET(N,3): NEXT: PRINT
220 PRINT "THE GAME INVOLVES A TABLE DEPICTING
THIRTY SIX NUMBERS, COLOURED EITHER GREEN
OR BLACK, ONTO WHICH CHIPS ARE PLACED TO IN-
DICATE THE BETS MADE BY PLAYERS. THE GREEN
NUMBERS ARE UNDERLINED."
230 PRINT "ONCE ALL BETS HAVE BEEN MADE, A
MARKER IS ALLOWED TO TRAVEL DOWN A SERIES
OF COLUMNS, STOPPING AGAINST A SINGLE
NUMBER, SELECTED AT RANDOM. ANY CHIPS
PLACED ON THIS NUMBER, OR ON ONE OF
SEVERAL";
240 PRINT "(6SPC)CATEGORIES INTO WHICH THE
NUMBER FALLS, WIN AN AMOUNT (15SPC)
CORRESPONDING TO THEIR GIVEN ODDS (16SPC)
THE FOLLOWING BETS MAY BE MADE:"
250 PRINT "ANY NUMBER ON THE TABLE, 1ST, 2ND OR
3RD ROWS OF THE TABLE, ALL LOW NUMBERS
(LESS THAN 18), ALL HIGH NOS, ALL ODD, ALL
EVEN, ALL GREEN OR ALL BLACK. A MAXIMUM OF
SIX BETS MAY BE MADE BY EACH"
260 PRINT@916,"PLAYER BEFORE EACH SPIN."
270 PRINT@976,"PLEASE PRESS SPACE BAR TO BEGIN";
280 IF INKEY$ <> " " (1SPC) GOTO 280
399 '*** DRAW BOARD
400 CLS: PRINT@24,"DIGITAL ROULETTE": PRINT: PRINT
410 FOR N=1 TO 9: READ R1$,R2$,R3$,R4$: PRINT
TAB(0)R1$TAB(3)R2$TAB(6)R3$TAB(9)R4$:NEXT
420 R1$=CHR$(131):R2$=CHR$(131)+CHR$(131)
430 PRINT@214,"LOW":PRINT@228,"ODD":PRINT@2
44,"GREEN";
440 PRINT@334,"T":FOR N=17 TO 50 STEP 3: PRINT
TAB(N)N-14::NEXT
450 PRINT@402,R1$:PRINT TAB(24)R1$TAB(27)
R2$TAB(35)R2$TAB(39)R2$TAB
(47)R2$TAB(51)R2$
460 PRINT@462,"S":FOR N=17 TO 50 STEP 3: PRINT
TAB(N)N-15::NEXT
470 PRINT@533,R1$:PRINT TAB(31)R2$TAB(43)
R2$TAB(55)R2$;
480 PRINT@590,"F":FOR N=17 TO 50 STEP 3: PRINT
TAB(N)N-16::NEXT
490 PRINT@658,R1$:PRINT TAB(24)R1$TAB(35)
R2$TAB(39)R2$TAB(47)R2$TAB
(59)R2$;
500 PRINT@725,"HIGH":PRINT TAB(35)
"EVEN"TAB(52)"BLACK"
510 FOR X=48 TO 79: SET(X,3): NEXT
520 FOR X=34 TO 127: SET(X,7): SET(X,37): NEXT
530 FOR X=26 TO 127: SET(X,13): SET(X,19): SET(X,25):
SET(X,31): NEXT
540 FOR Y=8 TO 12: SET(34,Y): SET(59,Y): SET(91,Y):
SET(127,Y): NEXT
550 FOR Y=32 TO 36: SET(34,Y): SET(59,Y): SET(91,Y):
SET(127,Y): NEXT
560 FOR Y=14 TO 30: SET(26,Y): SET(34,Y): SET(127,Y):
NEXT
570 DATA 32,"(1SPC)6","(1SPC)5",
22,15,27,24,18,19,13,16,29,"(1SPC)4",36,33,"
(1SPC)7",21,11,* (1SPC)1",28,"(1SPC)2",
30,20,12,25,"(1SPC)8",14,35,17,23,31,"(1SPC)3",34,10,
"(1SPC)9",26

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599 '*** INITIALISE
600 PRINT@896,"HOW MANY PLAYERS (1 TO 6)": INPUT
P$
610 P=INT (VAL(P$)): IF P>0 AND P<7 GOTO 640
620 FOR M=1 TO 5: PRINT @913, STRING$(20,32): FOR
N=1 TO 100: NEXT N
630 PRINT @913,"(1 TO 6)": FOR N=1 TO 100: NEXT N,M:
GOTO 600
640 DIM PN$(P), PA(P,6), PB$(P,6),B$(3,9)
650 FOR N=1 TO P: PRINT @896,"ENTER FORENAME OF
PLAYER"N;
660 INPUT PN$(N): PRINT @832,: PRINT:: NEXT
670 PRINT @896,"EACH PLAYER STARTS WITH 100
POUNDS IN TEN, 10 POUND CHIPS, BETS MUST BE
IN MULTIPLES OF 10 POUNDS.";
680 FOR N=1 TO P: PA(N,0)=100: NEXT:
R1$=CHR$(140): R2$=CHR$(32)
690 FOR M=1 TO 3: FOR N=1 TO 9: READ B$(M,N): NEXT
N,M
700 DATA F,S,T,L,H,O,E,G,B,591,463,335,218,730,
232,744,250,726,2,2,2,1,1,1,1,1
710 GOSUB 1040: RANDOM
799 '*** MAKE BETS
800 FOR L=1 TO P: A=0: BA=0: C=1
810 IF PA(L,0)=-1 GOTO 1030 ELSE PRINT @832,
PN$(L)"(10SPC)"
820 IF PA(L-0)=0 PRINT "YOU HAVE NO FUNDS AND
YOUR ACCOUNT IS CLOSED. THANK YOU." :
PA(L,0)=-1: GOSUB 1040: GOTO 1030
830 INPUT "ENTER AMOUNT OF BET (MULTIPLES OF 10
POUNDS)": A$
840 A=VAL (A$): IF A$="0" GOTO 1030 ELSE IF A<0 OR
BA+A>PA(L,0) GOTO 890
850 IF A\10=INT (A/10) AND A<> THEN PA(L,C)=A:
BA=BA+A: GOTO 900
860 FOR M=1 TO 5: PRINT @916, STRING$(24,32)
870 FOR N=1 TO 100: NEXT N: PRINT @ 916,
*(MULTIPLES OF 10 POUNDS)*
880 FOR N=1 TO 100: NEXT N,M: GOTO 810
890 PRINT@896, *SORRY, THIS HOUSE ALLOWS NO
CREDIT. PLEASE REVISE YOUR BET.*: GOSUB 1040:
GOTO 810
900 PRINT@896,* enter bet 6numbers 1-36, F,S,T,L,H,O,E,
G OR B)*
910 INPUT B$: B=INT(VAL(B$)): IF B>0 AND B>37 GOTO
970
919 'CATEGORY BET
920 FOR M=1 TO 9: IF B$<>B$(1,M) GOTO 940
930 S=VAL(B$(2,M)): GOSBU 1050: O$=B$(3,M) + *:1*:
PB$(L,C)=B$
940 NEXT M: IF PB$(L,C)<>* GOTO 990
950 PRINT@896,* YOUR BET IS NOT UNDERSTOOD.
PLEASE REVISE *STRING$(23,32);
960 GOSBU 1040: PRINT@832,PN$(L): GOTO 900
969 'NUMBER BET
970 S1=INT ((B-.1)/3): S=388*S1-128*B+721: IF B<10
THEN S=S+2-S1
980 GOSUB 1050: o$=*PB$(L,C)=B$
989 'ODDS AND REPEAT
990 PRINT@832,: PRINT: PRINT@896,*ODDS ON THIS
BET ARE *O$;
1000 C=C+1: IF C>6 OR BA=PA(L,o) GOSUB 1040: NEXT
L: GOTO 1200
1010 PRINT@928,*FURTHER BETES (Y OR N)*: INPUT
F$
1020 IF F$=*Y* PRINT@832,: PRINT:: GOTO 810 ELSE IF
F$<>*N* GOTO 1010
1030 NEXT L: GOTO 1200
1039 'BLANKING ROUTINE
1040 FOR N=1 TO 2000: NEXT: PRINT@768,: PRINT:
PRINT: PRINT:: RETURN
1049 'DISPLAY CHIPS ROUTINE
1050 S1=PEEK(S+15360)
1060 IF S1=32 PRINT@S,CHR$(129):: RETURN
1070 PRINT@S, CHR$(S1+S1-127):: RETURN
1099 '*** RUN WHEEL

```


PROGRAM LISTING

```

1200 PRINT@768,: PRINT: PRINT: PRINT:
    PRINT@917,★PRESS SPACE BAR TO PLAY★
1210 IF INKEY$<>★(1SPC)★ GOTO 1210 ELSE
    PRINT@D,R2$:: R=RND(2)+2: R1=RND(36)
1220 FOR L=1 TO R: FOR M=2 TO 11 STEP 3: FOR N=192
    TO 704 STEP 64
1230 PRINT@M+N,R1$:: PRINT@M+N-64,R2$:: NEXT N
1240 PRINT@704+M,R2$:: NEXT M,L: C=1: D=0
1250 FOR M=2 TO 11 STEP 3: FOR N=192 TO 704 STEP 64
1260 PRINT@M+N,R1$:: PRINT@M+N-64,R2$:
1270 IF C=R1 THEN D=M+N:
    W$=CHR$(PEEK(D+15358))+CHR$(PEEK(D+15359)):
    M=11: N=704
1280 C=C+1: NEXT N: IF D<>715 PRINT@704+M,R2$
1290 NEXT M
1399 **** ASSESS WINNING NUMBER/CATEGORIES
1400 W=VAL(W$): T=W-INT((W-.1)/3)*3
1410 IF T=3 THEN T1$="T" ELSE IF T=2 THEN T1$="S"
    ELSE T1$="F"
1420 IF W<19 THEN T2$="L" ELSE T2$="H"
1430 IF W/2=INT(W/2) THEN T3$="E" ELSE T3$="O"
1440 IF W=1 OR W=3 OR W=5 OR W=7 OR W=9 OR
    W=12 OR W=14 OR W=16 OR W=18 OR W=19 OR
    W=21 OR W=23 OR W=25 OR W=25 OR W=27 OR
    W=30 OR W=32 OR W=34 THEN T4$="G" ELSE
    T4$="B"
1599 **** UPDATE PLAYERS' ACCOUNTS
1600 FOIR L=1 TO P: IF PA(L,0)=-1 GOTO 1710 ELSE
    PA=0: PS=0: FOR M=1 TO 6: PW=0
1610 IF PBS$(L,M)=W$ THEN PW=36*PA(L,M)
1620 IF PBS$(L,M)=T1$ THEN PW=3*PA(L,M)
1630 IF PBS$(L,M)=T2$ THEN PW=2*PA(L,M)
1640 IF PBS$(L,M)=T3$ THEN PW=2*PA(L,M)
1650 IF PBS$(L,M)=T4$ THEN PW=2*PA(L,M)
1660 PA(L,0)=PA(L,0)+PW-PA(L,M): PS=PS+PA(L,M): IF
    PW>0 THEN PA=PA+PW-PA(L,M)
1670 PA(L,M)=0:PBS$(L,M)="" : NEXT M:
    PRINT@832,PN$(L)" [ 10SPC ]"
1680 PRINT"WON:"PA" [ 4SPC ]STAKE:"PS" [ 4SPC
    ]BALANCE:"PA(L,0)
1690 PRINT@980,"PRESS SPACE BAR WHEN READY":
1700 IF INKEY$<>" [ 1SPC ]" GOTO 1700 ELSE CH=0:
    FOR N=1 TO P: IF PA(L,0)<=0 THEN CH=CH+1:
    NEXT
1710 NEXT L: IF CH=P GOTO 1860
1799 **** ANOTHER SPIN?
1800 PRINT@768,: PRINT: PRINT: PRINT:
1810 PRINT@918,"ANOTHER SPIN (Y OR N)": INPUT A$
1820 IF A$="N" GOTO 1860 ELSE IF A$<>"Y" GOTO 1810
1830 FOR N=1 TO 9: PRINT@VAL(B$(2,N)),CHR$(32):
    NEXT
1840 FOR N=1 TO 36: S1=INT((N-.1)/3):
    S=388*S1-128*N+721: IFN<10 THEN S=S+2-S1
1850 PRINT@S,CHR$(32): NEXT: PRINT@768,: PRINT:
    PRINT: PRINT: GOTO 800
1860 RESTORE: GOSUB 20: PRINT@960,: PRINT: PRINT:
    PRINT: PRINT
1870 PRINT@384,: FOR N=1 TO P: IF PA(N,0)=-1 THEN
    PA(N,0)=0
1880 PRINT TAB(13)PN$(N)"HAS A FINAL BALANCE
    OF"PA(N,0)"POUNDS": NEXT
1890 PRINT TAB(19)"THANK YOU FOR YOUR CUSTOM":
    PRINT: END

```

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The Stripeland IPTC system has been developed to provide an extremely flexible remotely located control and logging system capable of full two-way communication over existing A.C. mains lines; twisted pair or balanced feeder; or any other inplant wiring where, for reasons of cost or inconvenience, a dedicated multiple wiring system would be unsuitable.

The IPTC equipment comprises two models of Remote Location Units (TC 105 and TC 115 Super) and a computer communications interface for central control.

The IPTC equipment, when interfaced with a computer/micro processor, has a very large range of applications. If one considers that they can control and switch any electrical appliance, as well as collecting and storing data, you can get some idea of its range. The IPTC remote units will not only act as interpreters of the central control computer's programmes, but will also act as a stand alone device in control and logging applications.

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Description: The TC 105 basic remote controller is a processor based transceiver unit developed to receive and transmit data over A.C. mains cables or balanced line feeder.

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Features: • Two analogue inputs • Two analogue outputs • Two on/off high priority inputs • Total 44 input/output lines • Microprocessor control with watchdog timer for software protection • 4K Eprom operating firmware • 1 or 2K Ram for onboard data storage (expandable) • Functions as stand alone controller and data logger or slave in multiple system with central control • Two-way communication with central control via existing A.C. lines without the need for dedicated cabling • Alternative communication via balanced line feeder (Bus) • Ideally suited to installations in control and data logging where, for reasons of expense or inconvenience, dedicated multiple cabling is unsuitable.

TC 115 Super

The TC 115 remote controller has all the features of the 105 with the following additions: • Processor has additional Ram for data storage • Real time clock facility.

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PCT/10/82

NEW BRAIN



The long-awaited NewBrain is finally in production and Chris Palmer has delved inside it to find out how it performs.

The NewBrain is a difficult machine to categorise. On the one side it is a powerful small business machine, comparable with the PET or Apple, whilst its price brings it on a level with the VIC and Atari.

The standard model will cost you £233 inclusive and for this you get the machine itself with 32K of RAM, an external power supply, a lead to connect the machine to a standard tape recorder, a lead to plug it to a domestic television (the modulator is included inside the machine's case), and the operating manual. There is another version of the machine available that has an integral display unit, but more of that later.

On removing the machine from its packaging you are confronted with a very neat, compact unit that has a professional air about it. The case measures 27cm X 16.5cm X 4cm, with the keyboard occupying the full width. The keyboard is laid out in QWERTY style and the keys are spaced far enough apart to allow a touch typist to feel comfortable. Two points which I found slightly annoying when using the keyboard were the positioning of the cursor and control keys, which are placed along the bottom and sides of the keyboard. This means that you have to reach over them to use the

keyboard for typing. The other problem was caused by the slow keyboard response, which meant it was easy to type something in only to find that a couple of the keystrokes had not registered. Apart from these minor hazards, the keyboard worked well and is sturdily built.

Furthering the NewBrain's well thought out approach is the design and layout of the connector sockets on the back. All the external connections are mounted in a plastic housing on the back and are recessed to prevent damage to the connector pins. They are all clearly labelled and keyed, so that it would take a lot of brute force and ignorance to connect the machine up wrongly. One small grievance, they do not provide you with an ON/OFF switch, therefore putting the power socket high on the wear and tear list, as unplugging the machine is the only way to reset it.

The NewBrain will run on either a normal television, from the UHF output, or a video monitor, by using the monitor output. However, if you wish to run both you can, but there might be slight degradation in picture quality. This feature is a bonus to anybody using the NewBrain in a school, where the ability to run a 'repeater' screen can make life a lot

easier in the classroom.

A Good Turn On

When you connect up the machine and switch on the power, nothing happens for about ten seconds while the machine is going through its initialisation routine. When this is completed you see NEWBRAIN BASIC and the READY prompt appear on the screen. The machine is now ready to operate.

The NewBrain comes supplied with ANSI (American National Standards Institute) BASIC in ROM, but it will also support a CP/M operating system as well, making it a flexible machine for languages. The BASIC should hold no great difficulties for those already familiar with Microsoft in any of its forms, but unfortunately for the novice, the manual offers no great encouragement.

Unfriendly Manual

It is a pity that Grundy Business Systems did not make the manual a littler more 'user-friendly' because the NewBrain will doubtless find its way into the hands of people who have had no previous knowledge of computers.

Especially weak is the chapter

on graphics. This is unfortunate because although the NewBrain has some very powerful graphics facilities, they are not straightforward to use and the manual does little to explain clearly the methods by which they are accessed and controlled. Roughly half of the manual is taken up with appendices that give information on error codes, character sets, and keywords. Although these are useful it would have been of far greater value to the beginner if the teaching section of the book had been enlarged and written in a more accessible fashion.

The NewBrain BASIC does offer you some useful commands which are not usually found in other versions of BASIC. These are:

- CLEAR:** this acts as the reverse of the DIM statement by freeing the memory space previously allocated to an array.
- BASE:** this command allows the programmer to select arrays which either start at position 0 or 1.
- LINPUT:** this is a special form of the INPUT statement which allows everything on a line, up to the NEWLINE character, to be input. This will allow you to input commas and other separators which a normal INPUT would reject.
- INSTR:** allows you to search a specified string for the occurrence of another string and prints out the character position of the string. Very useful for programs where you have to match a string into part of another.

As I mentioned earlier, the graphics capabilities are very powerful. The graphics commands available to the user are shown in figure 1. Using these virtually any design or shape can be drawn on the screen in high-resolution, but not in colour.

No Colour

The absence of colour or sound on the NewBrain is a little perplexing. One would have thought that on a machine which could compete with the Atari or the BBC computers they would have included colour and sound, as they are two of the biggest selling points of the other machines. Although it is unlikely that the NewBrain will be

fitted with a colour board, Grundy are thinking about producing a colour machine some time in the future.

While still on the subject of displays it is worth noting that the NewBrain comes in two models. The NewBrain A, which offers a display format of either 40 or 80 characters a line and 25 or 30 lines per page. The NewBrain AD has the same specification as the A, but also includes an in-built, single line, green phosphor display. This means that the computer can be run and programmed without having to plug it into a monitor or television. The display is very clear and, for its size limitations, easy to use. You can edit programs and list them, stepping through one line at a time by pressing the NEWLINE key and display information by scrolling the display from left to right.

Portable Brains

The single line display coupled with the optional battery pack means that this machine can travel anywhere you do.

One of the most common failings of machines in this class is their lack of memory. Not so with the NewBrain. There are four sizes of expansion memory available, the

smallest being 64K and the largest, 512K.

Other add-ons planned are the usual printers and floppy disc drives along with the slightly more adventurous hard discs and networking systems. The NewBrain also accepts programs and utilities on ROM, which have to be plugged into the board itself, as opposed to the more flexible cartridge system.

Software

There is a small amount of software around which is aimed at the business user/engineer but as with all machines when they become widely available, independent software houses write and convert their own programs for the new computer. Take heart any games fan who has already got a NewBrain, there should be a space invaders for it soon.

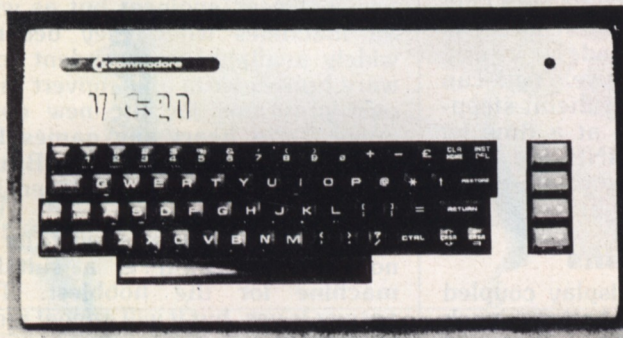
The final question is whether or not the NewBrain is a suitable machine for the hobbyist. The answer is yes, but it will appeal more to the person who has business or scientific interests foremost and hobby applications as a sideline. Given a better manual and some colour and sound the Grundy NewBrain would be one of the leaders of the home computer field.

Graphics Commands

PLOT	This command prefaces all the other graphics commands, telling the machine to expect a graphic instruction.
AXES	Draws an X and Y axis from the current pen position and labels it.
BACKGROUND	Allows you to set the background colour to either black or white.
COLOUR	Sets the pen colour to either the background colour, the foreground colour or the inverse of whatever colour it is plotting over.
CENTRE	Sets the position of the origin.
DEGREES	Allows angles to input in degrees.
DOT	Draws a single dot or pixel on the screen.
DRAW	Draws a line from the current pen position to an X,Y co-ordinate.
DRAWBY	Draws a line of a specified distance at a given angle.
FILL	Fills in an enclosed area starting from the pen position.
MODE	Sets the colour for plotting text.
MOVE	Moves the graphics pen to an X,Y position, drawing as it goes.
MOVEBY	Moves the pen in its current direction, drawing as it goes.
RADIANS	Allow angles to be input in radians.
RANGE	Sets the horizontal and vertical ranges for the screen.
TEXT	Allows text to be displayed on a high resolution screen.
TURN	Turns the pen.
TURNBY	Turns the pen through an angle.
WIPE	Clears the graphics screen.

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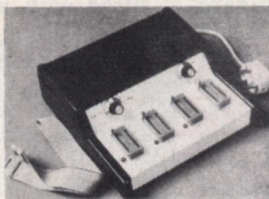
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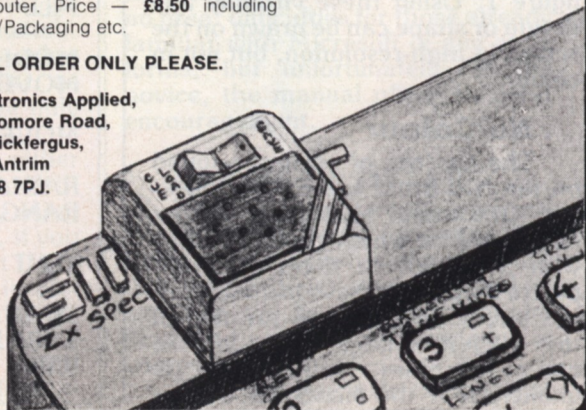
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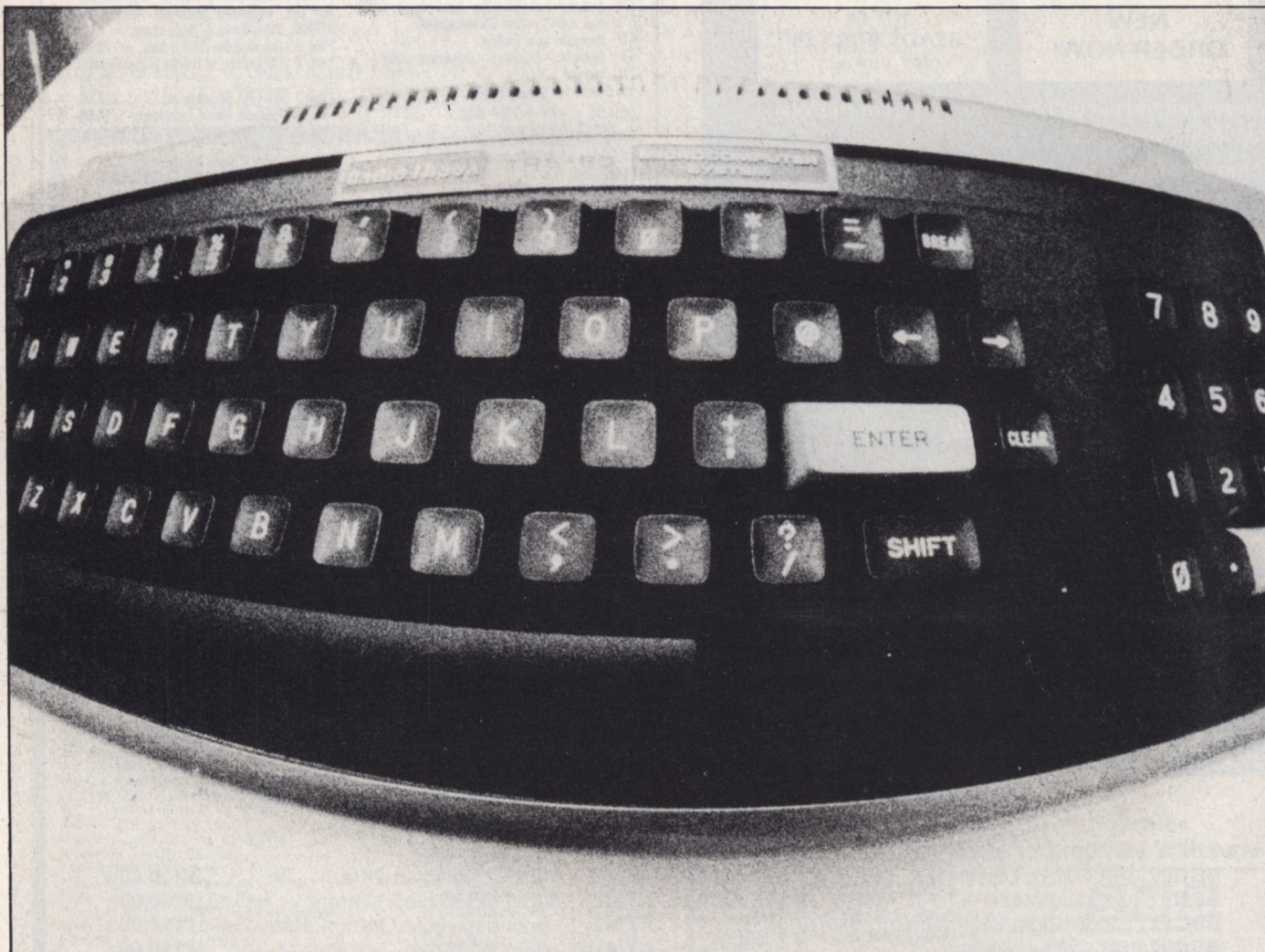


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MICROSPOT

RANDOM NUMBERS

In this easily adaptable routine S. Dillon shows you how to generate unrepeatable random numbers.



This is a program designed specifically for TRS-80 users, but is readily adaptable for any microcomputer. The purpose of the program is to produce random numbers within predefined limits, but so that each number is only produced once.

This is ideal for uses such as bingo calling, or pools forecasting. There are many more applications for such a routine, particularly in the field of adventure gaming (and its various forms).

Random Numbers

```

5  CLS : PRINT "(40 spaces)";: PRINT "B I N G O(14 spaces)";
10  RANDOM : DIM R(90)
15  T=T+1
20  S=RND(90)
25  IF R(S)=1 THEN GOTO 20
30  R(S)=1
35  IF S<10 THEN PRINT " ";S; ELSE PRINT S;
```

```

40  IF T=10 THEN T=0 : PRINT "(24 spaces)";
45  REM : INSERT AN INKEY$ OR GET ROUTINE HERE: — eg.
    45 IF LEN (INKEY$) = 0 THEN GOTO 45
50  GOTO 15
```

```

LINE 5  Clears screen and prints "B I N G O"
LINE 10  Randomizer and dimensions the variable R. This can be
        set to the number of the range the numbers should fall
        eg. 1-90.
LINE 15  Counter used to enhance the display.
LINE 20  Creates a random number within the range (90).
LINE 25  If the number has previously been produced then produce
        a different one.
LINE 30  Remembers that the number has now been produced.
LINE 35  ENHANCES THE DISPLAY.
LINE 40  ENHANCES THE DISPLAY.
LINE 50  Chooses the next number.
```

Despite being short and simple, this program may be of use to anybody wishing to write programs containing random numbers.



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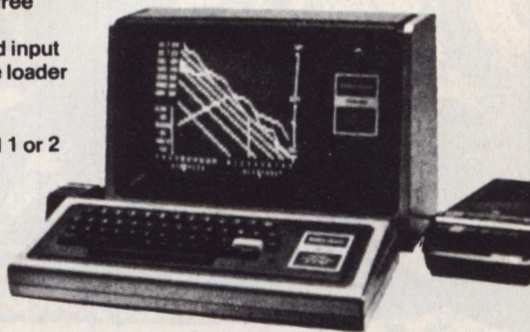
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BBC TEXT HANDLING



The ability to handle large amounts of text using microcomputers is the cornerstone of the electronic office. This program by Tony Latham shows you how to manipulate text on your BBC Model B computer.

This program has been specifically designed for use with the BBC Model B computer and either the Type II or Type III Epson 80 F/T printer.

We hope to explain how to adapt the program for use with other machines later in the article.

Clearly a high volume of text saved as strings within a program will use a large amount of memory.

This is overcome by handling only one page at a time and saving the completed page on a cassette file. These pages may be recalled, sent out to a printer, viewed or amended as required.

A page as understood by an Epson or Centronics printer would be an average of about 66 lines, of up to 80 characters per line. Each line of text is renumbered for display

purposes only and can be called by number into a position where it may be deleted or edited in a variety of ways. Note that the £ symbol should be read as (shifted 3). If you manage to get into trouble press ESCAPE and type GOTO 220 then press RETURN, as this will direct you to the next line entry point and await your option.

HOW IT RUNS

Line 30 calls mode 3 which puts the screen into a condition where it displays 80 characters x 25 lines. Line 40 dimensions the number of text strings. Line 60 inputs the starting page number (usually 1) unless a tape load of a partially completed page alters this using PAN (Page number). Lines 80-320 prints out the options at top of screen and initializes the user defined keys. These are used to call the printer, tape and editing functions.

At the bottom of the screen the program draws a numbered grid as a guide for the positioning of characters in the same way as a modern typewriter. The gap between the prompts and grid is defined as a scrolling text window.

The user defined keys are arranged to deliver a single letter in square brackets as a string, lines 330-510 accept the typed input line and check to see if the line consists only of the symbol [strings] which would redirect the proceedings to the relevant part of the program. If the symbols are not present the input string is saved in the previously dimensioned array and the line count is incremented. The procedures that can be called follow, and are written in blocks.

Lines 52-760 are the printer routines and allow you to dictate how many copies are printed and asks you if you require a tab.

On the Epson printer, movement of the head in the horizontal and vertical positions are controlled by sending out ASCII codes in a certain sequence. This type of formatting will be outlined later.

At line 610 a FOR-NEXT loop is entered from 1 to the number of lines stored in the array which examines each line to see if it contains symbols which would dictate a change of type face, page movements, underscore or dot graphics, these symbols being the ones specified in the Epson manual and are entered as two digit decimal numbers within the brackets e.g. [XX]. If such an identity is present the program goes into a procedure which generates the correct escape and CHR\$ codes in the correct sequence to invoke the desired effect. On return

from the procedure the program continues scanning until the end of that line and then re-enters the loop.

Where the Epson manual asks for +N¹ or +N² these are entered as three digit decimal numbers after the closing bracket e.g. [45] 001 = ESC - 1 or start underscore. Where +N² is a lot of numbers, as in graphics, these are entered without spaces.

Tape routines

Lines 810-980 determine whether you wish to load from an existing tape or save the current text. In both cases a procedure is called to arrange this. The procedure to save current text lies at 1450-1630. In this procedure a file name A\$ is constructed using the word page plus the string of a number. This number is updated after each save as if you were writing a book and you were saving the pages sequentially. You are offered the option of changing the file name prior to the actual procedure line 1570-1620. Previously saved files are fetched back in the array at line 1270-1400. Again you are asked if you want a special file name or, as an alternative, which page number you wish to load, the actual lines being stored at 1340-1390.

Lines 880-980 allow you to read the blocks of stored text, each block being updated by a key press.

Lines 990-1090 would put a specified line in a position where you are allowed to re-enter that line using normal editing features in order to make alternatives to the text. Lines 1100-1260 take the last line entered and centre it within the length of line specified. This is used to centre headings and drawings. Lines 2260-2280 would delete a specified line. Lines 2290-2350 will insert the last entered line into any other specified line position, moving the array to accommodate this.

HINTS ON CONVERSION

In converting for other computers line 30 could be ignored. At line 110 PROCOption you would use GOSUB 1880 with the RETURN placed at 2010. Wherever the BBC machine says PROCXX, you will find further down the listing Def ProcXXX which is the point that GOSUBS are attracted to, the nearest ENDPROC after that point being the RETURN. Within the subroutines if you have not got user defined keys enter the lines as [X], X being a letter as shown in lines 1910-2000. You will be entering the identifier to call tape, printer etc. Line 130 prints a mini logo across the screen to physically separate the text window from the displayed prompts. You can simply draw a line across the screen to serve this purpose. Line 190 defines the scrolling window. If this is not possible on your machine simply arrange to scroll the whole screen and reprint the options and the grid.

In line 220 VDU 15 means leave page mode and may be omitted. Line 280 calls two procedures to be executed within a loop. ProcNo can be found at 1770-1800. Line 1780 states @% = &00000902; this arranges for numbers to be printed in a format that contains only two digits. You can simulate this on most machines using a PRINT USING statement. Line 1790 restores normal number handling before returning from the subroutines. Line 1810 prints out the lines of text from the array on the screen relevant to the current line number.

The text you enter is accepted at line 350. The BBC machine uses INPUT LINE which allows quotation marks and any other information without limitation to be entered. On most other machines the accidental entry of " " within strings would give rise to a type mismatched error.

To eliminate this possibility the lines could be constructed as follows:

```
350 I = INKEY(0)
```

```
351 If I = 35 then 350
352 If I = - 1 then 350
353 If I = 13 then 360
354 If I = 127 then (Proc.to deduct CHR$)
355 U$ = U$ + CHR$(I)
356 GOTO 350
```

At line 530 the *FX6,0 asks for the output to printer to be Centronics parallel with a carriage return and line feed added to the end of each line. Many printers have internal DIP switches for auto line feed and carriage return to be selected. If these are in the selected state then *FX5,1 should be used. In the event of requiring serial feed whilst leaving the parallel option then the procedure line 521-539 should be used. As a point of interest VDU2 switches the printer on, VDU3 switches the printer off.

The INKEY command mentioned above simply inputs a single character as an ASCII value. Many machines may use GET\$ and break the \$ to the ASCII value in order to detect the escape key codes and eliminate the possibility of entering quotation marks. The trapping of - 1 at line 352 is present because - 1 is returned if no key is pressed in response to the INKEY. The above procedure recognises the return key in order to escape what would otherwise be a closed loop.

In a number of places within the program i.e. line 660 you will come across VDU1 PRINT CHR\$(27);: VDU1: print "D". The VDU1 means send the next character to the printer only, the CHR\$(27) being ESC = escape and in effect would be sending ESC D to the printer. Printers accept their commands mixed with the data on the data bus lines. The main reason for VDU1 is to stop the BBC display devices from accepting the PRINT CHR\$(X) values as instructions to itself, obliging it to go into weird and wonderful modes from which it may never recover until switched off.

PROGRAM LISTING

```

10 REM COPYRIGHT (C) TONY LATHAM 1982
20 REM COMPUTER USERS CLUB
30 MODE3
40 CLEAR:DIMT$(64)
50 PRINT
60 PRINT"PAGE NO":INPUT,C%
70 PAN = 1
80 CLS:PRINT
90 PRINTTAB(29);"TEXT (LINE) PROCESSING"
100 PRINT
110 PROCOptions
120 PRINT
130 VDU23,244,15,127,11,219,195,240,247,240
140 FOR R = 0 TO 79:PRINTCHR$(244)::NEXT
150 PRINTTAB(0,24);"0";
160 FOR F = 0 TO 77:PRINT"-":NEXT
170 G = 10:L = 0
180 FORR = 1TO7:PRINTTAB(G,24);G::G = G + 10:-
NEXT
190 VDU28,0,23,79,9
200 T = 0
210 L = L + 1
220 VDU15
230 FOR R = 1 TO 20:PRINT:NEXT
240 PRINT TAB(20);"PAGE ";C%;" LINE ";L;"
(PAGE = ";64;" X ";70;" LINES/CHAR.)"
250 PRINT
260 D = L - 10:IFL < 10THEN D = 0
270 FOR R = D TO L - 1
280 PROCNO:PROCLINE:NEXTR
290 REM ALTER ENTRY
300 IF C% = PAN THEN 330
310 PRINTTAB(25);"** NEW PAGE NO";C%;"
STARTING **":PAN = C%
320 PRINT
330 R = L:VDU13;
340 PROCNO
350 INPUT LINE" "U$
360 IFU$ = " [ P ] "THEN520
370 IFU$ = " [ T ] "THEN780
380 IFU$ = " [ L ] "THEN820
390 IFU$ = " [ R ] "THEN850
400 IFU$ = " [ A ] "THEN960
410 IFU$ = " [ C ] "THEN1070
420 IFU$ = " [ N ] "THEN20
430 IFU$ = " [ D ] "THEN GOSUB 2040
440 IFU$ = " [ E ] "THEN2230
450 IFU$ = " [ I ] "THEN2260
460 T$(L) = U$
470 IFT = 1THENT = 0:L = G%:GOTO220
480 IF L = 62 THEN PROCFULL
490 L = L + 1
500 PRINT
510 GOTO330
520 REMPRINTER
530 *FX6,0
540 PQ = 0
550 PRINT
560 INPUT"HOW MANY COPIES",QU
565 INPUT "INPUT TAB-DEFAULT NONE",TB
570 PRINT
580 INPUT"POSITION PAPER,THEN ENTER",QME$
590 VDU2
600 FOR R = 1 TO (L - 1)
610 U$ = T$(R)
620 S = LEN(U$)
630 F1 = 0:F2 = 0
632 IF TB > 60 THEN PRINTCHR$(15);
635 IF TB > 0 THEN VDU1:PRINT
CHR$(27)::VDU1:PRINT"D":VDU1:PRINTCHR$
(TB)::VDU1:PRINTCHR$(0)::VDU1:PRINT
CHR$(137);
640 FORLP = 1 TO S
650 CS$ = MID$(U$,LP,1):CD$ = MID$(U$,LP + 3,1)
660 IF CS$ = " [ " AND CD$ = " ] " THEN
PROCFACE:GOTO680
670 PRINTCS$;
680 NEXTLF
690 PRINTCHR$(13)
700 NEXTR
710 GAP = 65 - L
720 PQ = PQ + 1
730 VDU3
740 PRINT:PRINT"PAGE ";C%;" COPIES = ";PQ
750 IF NOT (QU = PQ)AND(GAP > 30)THEN580
760 IF NOT (QU = PQ)AND(GAP < 31)THEN
VDU1:PRINTCHR$(12):VDU3:GOTO590
770 GOTO220
780 REM TAPE
790 INPUTTAB(7);"DO YOU WISH TO LOAD",QU$
800 IFLEFT$(QU$,1) = "Y"THENPROCFETCH:GOTO
220
810 PROCDITCH:GOTO220
820 REM LAST LINE
830 IFT$(L) = " "THENL = L - 1:GOTO830
840 L = L + 1:GOTO220
850 REM READ
860 R = 0:PRINT
870 N = INT((L + 4)/5)
880 FOR C = 1 TO N
890 FOR K = 1 TO 4
900 R = R + 1
910 PROCNO:PROCLINE
920 NEXT K
930 PRINT"KEY = CONTINUE":QU$ = GET$
940 NEXTC
950 GOTO220
960 REM ALTER
970 INPUT"WHICH LINE",QU
980 G% = 0
990 IFQU > 8THENG% = QU - 8
1000 FOR R = G% TO QU
1010 PROCNO
1020 PROCLINE
1030 NEXTR
1040 G% = L:L = QU
1050 T = 1:GOTO290
1060 GOTO220
1070 REM CENTRE
1080 QU = L - 1
1090 S = LEN(T$(QU))
1100 IFS < 3THEN T$(QU) = " " + T$(QU)
1110 I = INSTR(T$(QU)," [ > E")
1120 IFI = 0THEN1160
1130 IFS > 40THEN PRINT"STRING TOO
LONG":GOTO200
1140 VA = INT(70 - S)/2
1150 GOTO1180
1160 S = INT(S/2)
1170 VA = INT(35 - S)
1180 U$ = T$(QU)
1190 FOR R = 1 TO VA
1200 U$ = " " + U$
1210 NEXTR
1220 T$(QU) = U$
1230 GOTO220
1240 DEFPROCFETCH
1250 PRINT"INSERT DATA TAPE,PRESS PLAY"
1260 PRINT:INPUT"DO YOU WANT A SPECIAL
FILE",DU$
1270 IF DU$ = "YES"ORDU$ = "Y"
THENPROCCHANGE:GOTO1300
1280 INPUT"WHICH PAGE NUMBER",QU
1290 A$ = "PAGE" + STR$(QU)
1300 ONERRORGOTO1380
1310 B = OPENIN(A$)

```


TEXT HANDLING

PROGRAM LISTING

```

1320 INPUT#B,L
1330 FOR R=1 TO L
1340 INPUT#B,T$(R)
1350 NEXTR
1360 CLOSE#B
1370 ENDPROC
1380 REPORT
1390 PRINT"SORRY-ERROR"
1400 IF ERR=17THENEND
1410 GOTO250
1420 DEFPROC DITCH
1430 A$="PAGE"+STR$(C%)
1440 PRINT"THIS FILENAME IS"
1450 PRINT
1460 PRINTTAB(6),A$
1470 PRINT
1480 INPUT"DO YOU WISH TO CHANGE THIS",QU$
1490 A$="PAGE"+STR$(C%)
1500 IF LEFT$(QU$,1)="Y"THENPROCCHANGE
1510 PRINT"INSERT DATA TAPE,SET RECORDING."
1520 INPUT"ENTER WHEN READY",G%
1530 ONERROR GOTO 1610
1540 B=OPENOUT(A$)
1550 PRINT#B,L
1560 FOR R=1 TO L
1570 PRINT#B,T$(R)
1580 NEXTR
1590 CLOSE#B
1600 ENDPROC
1610 REPORT
1620 PRINT"ERROR"
1630 IFERR=17THENEND
1640 GOTO220
1650 DEFPROCCHANGE
1660 INPUT"WHAT NAME",D$
1670 INPUT"WHAT NUMBER",X
1680 A$=D$+STR$(C%)
1690 ENDPROC
1700 DEFPROC FULL
1710 PRINT"MEMORY FULL,SAVE TEXT"
1720 PRINT"THEN START 'NEW' PAGE"
1730 ENDPROC
1740 DEFPROCNO
1750 VDU15:@%=&00000902
1760 PRINT R:@%=2570
1770 ENDPROC
1780 DEFPROC LINE
1790 PRINT T$(R)
1800 ENDPROC
1810 DEFPROC LESS
1820 S=LEN(U$)
1830 U$=MID$(U$,1,(S-1))
1840 ENDPROC

```

```

1850 DEFPROC Options
1860 PRINT TAB(8);"F0= PRINTER. F1= TAPE. F2=
LAST LINE. F3= READ. F4= ALTER."
1870 PRINT TAB(8);"F5= CENTRE. F6= NEW PAGE.
F7= DELETE. F8= INSERT. F9= DISC."
1880 *KEY 0" [ P ]:M"
1890 *KEY 1" [ T ]:M"
1900 *KEY 2" [ L ]:M"
1910 *KEY 3" [ R ]:M"
1920 *KEY 4" [ A ]:M"
1930 *KEY 5" [ C ]:M"
1940 *KEY 6" [ N ]:M"
1950 *KEY 7" [ E ]:M"
1960 *KEY 8" [ I ]:M"
1970 *KEY 9" [ D ]:M"
1980 ENDPROC
1990 DEFPROC STRETCH
2000 S=LEN(T$(R))
2010 U$=MID$(U$,5,S)
2020 PRINTCHR$(142);CHR$(145);
2030 ENDPROC
2040 PRINT:PRINT"SORRY NO DISC YET"
2050 T$(L)="":L=L-1
2060 RETURN
2070 DEFPROC FACE
2080 LP=LP+1
2090 CS$=MID$(U$,LP,2):GOTO2120
2100 LP=LP+3
2110 CS$=MID$(U$,LP,3)
2120 CS=VAL(CS$)
2130 IFF2=1 AND CS$=" ))) "THEN
F2=0:GOTO2220
IF F2=1 THEN 2200
IFF1=1 THEN F1=0:GOTO2200
IFCS > 21 THEN VDU1:PRINTCHR$(27);
IF CS=45 ORCS=51 OR CS>65 THEN F1=1
IF CS=69 OR CS=70 OR CS=71 ORCS=72 OR
CS=84 THENF1=0
IF CS=66 OR CS=67 OR CS=68 OR CS=75 OR
CS=76 THEN F2=1
VDU1:PRINTCHR$(CS);
IFF1=1 OR F2=1 THEN2100
LP=LP+2:ENDPROC
INPUT"WHICH LINE ",QU
T$(QU)=" "
GOTO220
INPUT"WHICH LINE ",QU
M%=L+1
FOR LP=L TO (QU+1) STEP -1
T$(LP)=T$(LP-1)
2290 NEXTLP
2300 T$(LP)=T$(L)
2310 GOTO220
2320

```



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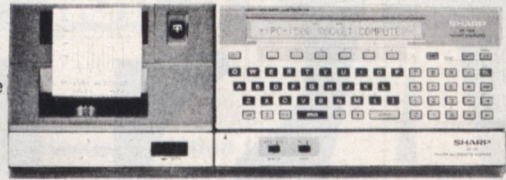
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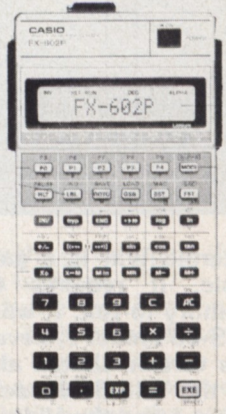
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SOFTWARE

ASTEROID WAR



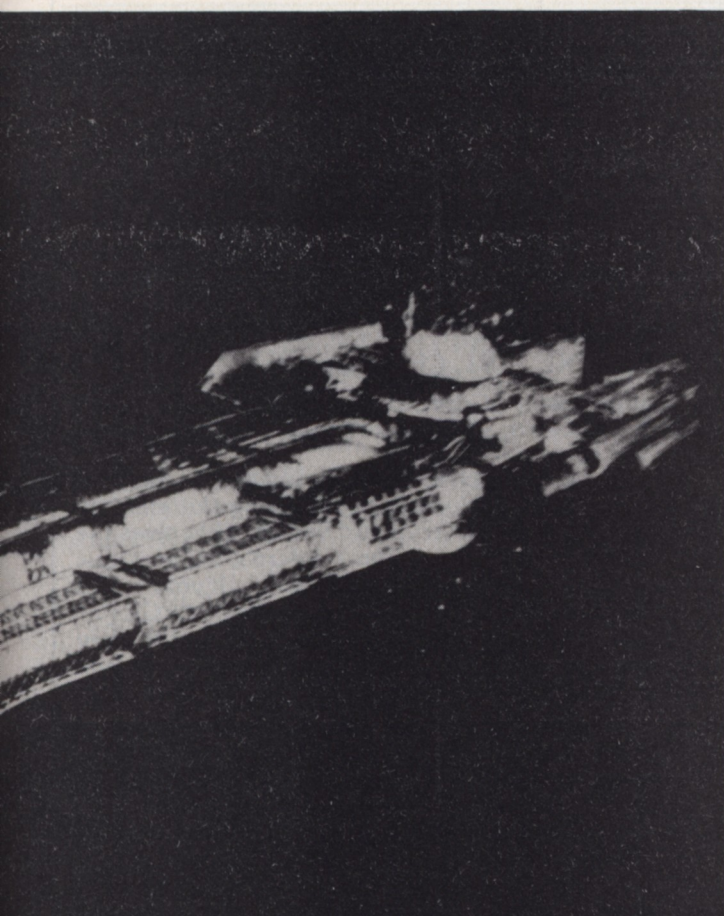
Asteroid War is a game written in basic. It requires under 2K of memory to run. It was written on a TRS-80 Model 1, Level 2. However, this version should also be suitable for the TRS-80 Model 3, the Video Genie 1 and the Video Genie 2. The program could be adapted for other micros without much difficulty.

When you RUN the program the screen is cleared and a short in-

roduction printed. You are asked at what level you wish to play. Level 1 is the easiest and Level 5 the most challenging. The screen is cleared again.

The design of this game is simple. The screen fills with white dots.

These represent the asteroids. They are stationary during the game. On Level 1 there are 100, on Level 2 there are 200, and so it increases. Also there are 10 other dots. These represent the enemy vessels. They move with a random motion around the screen. Additionally there is one dot at the centre of the screen. This represents your destroyer star ship. Its movement is under your control



**Test your skill
amongst the asteroid
fields of outer space
with this program
by Daniel Bishop.
It is written for a
TRS-80 Model 1, Level
2 but is also suitable
for the Model 3 and
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and by pressing the 'up-arrow' key it moves up the screen. By pressing the 'down-arrow' key surprise, surprise it moves down. By pressing the 'comma' or 'less-than' key it moves left. To move right press the 'full-stop' or 'greater-than' key.

During play the time elapsed is displayed in the top right of the screen. The number of enemy vessels destroyed by you is displayed

in the top left of the screen. To destroy an enemy vessel, manoeuvre your star ship so that it intercepts the enemy vessel.

The object is to destroy all ten enemy vessels in the shortest time possible. If you accidentally hit an asteroid then your ship is destroyed and that game ends. At the end of the game, the score is displayed, along with your best ever score. You

may then play the game again if you can stand the tension.

Although the game is simple, it is difficult. This is because the asteroids, the enemy vessels and your star ship are all represented as white dots. During play the screen appears to be a confusion of dots. This is intended to confuse you into crashing your star ship — and it usually does.

HOW IT RUNS

20	Sends execution to 410.
30	Peeks keyboard to see if keys relevant to game have been pressed.
40	Blanks out location of star ship (X,Y) on screen.
40-70	Calculates new location of star ship.
80	If new location is unoccupied (unlit) on screen then 120.
90-100	To reach these lines new location must be occupied. Tests to see if it is an enemy vessel. If it is then score of vessels destroyed (E) is incremented by one.
110	Starship must have crashed onto an asteroid and program execution is sent to 380.
120	New location of starship is lit on screen. If enemy vessel J has previously been destroyed then 280. Otherwise present location of enemy vessel J, (X(J),Y(J)), is blanked out on screen.
130-170	Depending on present course of enemy vessel J, D(J), new location is calculated.
180	If new location is not on edge of screen then 270.
190-260	To reach these lines new location must be on edge of screen, so new course for enemy vessel J is calculated.
270	Time elapsed (C) is incremented by one and displayed on screen. New location of enemy vessel J is lit on screen.
280	If all ten enemy vessels have been destroyed then 320.
300	Number of enemy vessels destroyed (E) is displayed on screen.
320-370	End display if all ten enemy vessels are destroyed.
380	End display if starship crashes onto asteroid.
390-400	Opportunity given to play game again.
410-420	Introduction to Asteroid War displayed on screen.
430	Input of level of play (1-5) as L\$.
440	Initialization of some variables.
450	Locations ((X(J),Y(J)) and courses D(J) of ten enemy vessels are chosen by random (J in this instance ranges from 1 to 10).
460	Asteroids are lit in random positions on the screen.

HINTS ON CONVERSION

As with all conversions between machines, one of the major differences lies in the screen formats. This program uses the block graphics of the TRS-80. These are low-resolution graphics, giving a screen resolution of 128 X 48, these are referenced from 0 to 127 horizontally and from 0 to 47 vertically.

In transferring this program to another machine you must first decide which sort of graphic display to use. If your micro has high-resolution graphics then you must scale its horizontal and vertical resolution accordingly. Also you will have to replace the commands SET and RESET with equivalents, such as PLOT and UNPLOT. The graphics command POINT used in 80 examines the position (x,Y) on the screen to see whether or not a point has been SET or not.

This can be simulated on a machine without high resolution graphics by POKEing characters onto the screen and using PEEK to determine whether or not a position has been filled. POKE does bring its own problems though. Because POKE is not specifically a graphics command it cannot be used with X and Y coordinates. This is because it is used to reference a position in memory, which runs serially, as opposed to a

screen position which are really matrix co-ordinates.

A routine for changing high-resolution co-ordinates to POKE values for a machine with a 40 x 25 character screen is shown below:

```
REM X = Original co-ordinate, X1 = POKE value
REM Y = Original co-ordinate, Y1 = POKE value
REM BV = Base value for start of screen locations
X1 = X
Y1 = 40 * Y
POKE BV + X1 + Y1, Character value
```

This routine assumes that the values of X and Y have already been scaled, so as not to produce results that are outside the screen area.

The line (30) which looks at the keyboard to see if a key has been pressed does so by PEEKing the memory registers which hold the keyboard values. This gives the game smooth movement. Some micro's support this system, noticeably the Commodore range. If your micro does not allow this then it can be replaced with a GET or INKEY statement, although this does mean that the key will have to be depressed and released for every movement, unless you have a repeat facility on the keyboard.



PROGRAM LISTING

ASTEROID WAR

BY DANIEL BISHOP, JUNE 1982 *

```

10 REM* ASTEROID WAR
20 GOSUB 410
30 FORJ=1TO10:G1=PEEK(14400):G2=PEEK(14500):IFG1<>8ANDG1<>16ANDG2<>
16ANDG2<>64THEN120
40 RESET(X,Y):IFG1=8ANDY>1THENY=Y-1:GOTO 80
50 IFG1=16ANDY<46THENY=Y+1:GOTO 80
60 IFG2=16ANDX>1THENX=X-1:GOTO 80
70 IFG2=64ANDX<126THENX=X+1
80 IFPOINT(X,Y)=0THEN 120
90 FORJ=1TO10:IFX(J)=XANDY(J)=YTHENX(J)=0:E=E+1:GOTO 30
100 NEXTJ
110 GOTO 380
120 SET(X,Y):IFX(J)=0THEN 280 ELSERESET(X(J),Y(J))
130 OND(J)GOTO 140 , 150 , 160 , 170
140 X(J)=X(J)-1:Y(J)=Y(J)-1:GOTO 180
150 X(J)=X(J)+1:Y(J)=Y(J)-1:GOTO 180
160 X(J)=X(J)+1:Y(J)=Y(J)+1:GOTO 180
170 X(J)=X(J)-1:Y(J)=Y(J)+1
180 IFX(J)<>126ANDX(J)<>1ANDY(J)<>46ANDY(J)<>1THEN 270
190 IFX(J)=126ANDD(J)=2THEND(J)=1:GOTO 270
200 IFX(J)=126ANDD(J)=3THEND(J)=4:GOTO 270
210 IFX(J)=1ANDD(J)=1THEND(J)=2:GOTO 270
220 IFX(J)=1ANDD(J)=4THEND(J)=3:GOTO 270
230 IFY(J)=46ANDD(J)=3THEND(J)=2:GOTO 270
240 IFY(J)=46ANDD(J)=4THEND(J)=1:GOTO 270
250 IFY(J)=1ANDD(J)=1THEND(J)=4:GOTO 270
260 IFY(J)=1ANDD(J)=2THEND(J)=3
270 C=C+1:PRINT@59,C:SET(X(J),Y(J))
280 IFE=10THEN 320
290 NEXTJ
300 PRINT@1,E;"ENEMY VESSELS DESTROYED";
310 GOTO 30
320 CLS:PRINT"YOU HAVE DESTROYED THE ENEMY. CONGRATULATIONS!"
330 PRINT"IT TOOK YOU";C;"TO DO IT."
340 IFW=0THENW=C:GOTO 390
350 IFC<WTHENW=C:PRINT"YOUR BEST SCORE YET!":GOTO 390
360 IFC=WTHENPRINT"YOU'VE EQUALLED YOUR BEST SCORE YET!":GOTO 390
370 IFC>WTHENPRINT"YOUR BEST SCORE IS STILL";W;"":GOTO 390
380 CLS:PRINT"YOU CRASHED ONTO AN ASTEROID AND YOUR SHIP HAS BEEN
DESTROYED! BE MORE CAREFUL IN FUTURE."
390 PRINT:PRINT"DO YOU WISH TO PLAY AGAIN (Y/N)?"
400 A$=INKEY$:IFA$="Y"THENGOSUB 440 :GOTO 30 ELSEIFA$="N"THENEELSE 400
410 DEFINTA-Z:CLS:PRINT"ASTEROID WAR";CHR$(244);"....."
420 PRINT"USE THE ARROW KEYS TO MANOUVRE YOUR DESTROYER STAR SHIP.
TRY TO INTERCEPT ALL THE ENEMY VESSELS . BUT BEWARE, DO NOT CRASH INTO
AN ASTEROID. DO YOU WISH TO PLAY ON LEVEL 1,2,3,4 OR 5?"
430 L$=INKEY$:IFVAL(L$)<1ORVAL(L$)>5THEN 430
440 X=63:Y=23:C=0:D=0:F=0:E=0
450 CLS:FORJ=1TO10:X(J)=RND(124)+1:Y(J)=RND(44)+1:D(J)=RND(4):NEXTJ
460 FORJ=1TO100*VAL(L$):V=RND(127):Z=RND(47):SET(V,Z):NEXTJ
470 RETURN

```


READER INITIATIVE TEST

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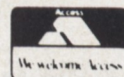
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MICRO FACTFILE

Factfile is our regular buyer's guide to microcomputers. Herein you will find all the important facts and figures on 26 of the most important micros on the market under £1000. The idea is that you are able to directly compare what different manufacturers are offering you and how much they are charging you for it. Many brochures and adverts bury the reader in a mass of irrelevant facts and figures, which make it difficult to judge one against the other.

Factfile sorts it all out for you!

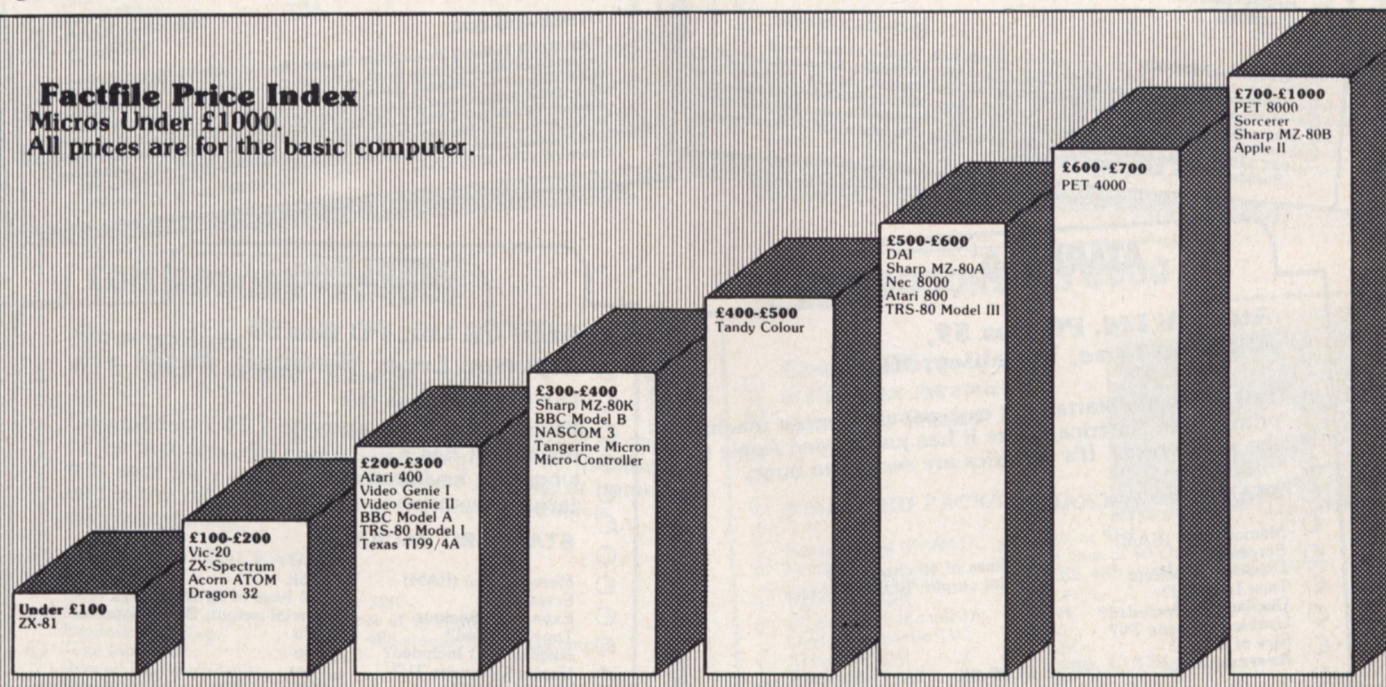
Just look down the price index to discover which machines are in your price-range and then consult the 'cards' on each. All the information is in a standard form and has all been checked by our technical staff. The section is presented alphabetically.

As new machines become available, we will add them into the FACTFILE as soon as we can.

Factfile Price Index

Micros Under £1000.

All prices are for the basic computer.



Factfile Glossary

RAM: Stands for Random Access Memory and it is in there to accept the user's programs. Amount of memory is measured in "thousands of bytes" or "K" ie, 8K. A byte is a computer 'word' or single piece of information, made up of eight 'bits' which are just 1 or 0. Hence you need thousands of bytes to store a reasonable size program, since each letter, number, full stop, comma, line number, etc, uses up computer 'words' quite rapidly.

As a guideline - you can get about 50 program lines into 1K and 250 into 8K. This is a rough estimate - don't take it literally! The figures are not straight multiples, because you need to allow the machine space to work on your listing, once you've typed it in.

ROM: Read Only Memory. The machine can look and see what is stored in the memory, but it cannot alter the contents, nor store anything new. Generally used for control programs, where the micro consults the memory to see what to do next at various points in the program. Languages, such as BASIC, are stored in ROM and allow the machine to interpret what you type in, in terms of its own 'machine code'.

SIZE OF BASIC: The number of bytes occupied by the BASIC language is important, as it is an approximate guide to the BASICs versatility. The more powerful the language, the easier it should be to use.

BUS CONNECTION: A socket on the micro which allows it to be linked up to various add-ons. This can take the form of many various items, ie, expansion box, printer, disc drives, plotting device. In short a BUS is an information 'window' through which the micro communicates with the outside world.

SERIAL/PARALLEL OUTPUT: This refers to the manner in which the micro transmits data to other units. If it puts out information in a long string, one bit after another, down a single wire or connector, it is a serial output. Parallel output is where pins or wires carry information simultaneously and are 'read' together as a block by whatever it is the micro is communicating with.

VIDEO OUTPUT: an output which will drive a monitor, as opposed to a TV set, allowing it's use as a screen for the computer.

REFERENCE FACTFILE

ACORN ATOM

Acorn Computers, 4A Market Hill, Cambridge.
Tel: 0223-245200.

- Acorn Computer's Atom is very popular with home users and is not really suited for business applications.
- The basic memory space is small but expansion is reasonably cheap.

STANDARD PACKAGE

Memory Size (RAM)	2K
Screen Size	16 lines of 32 characters
Expansion Sockets	BUS connector, Printer, Video output
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	£140 kit, £174.50 built

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	12K internal, 32K external options	£45-149
Printer	Yes	£232
Monitor	No	£299
Disc Drives	Yes	£11.50
Other Languages	Yes	—
Multi-user	Yes	£50
Capabilities	Yes, BBC BASIC	—
BASIC extensions (Toolkits)	Yes	—

OTHER ADD-ONS:

Centronics-type connector, Technomatic Ltd, 17 Burnley Road, London NW10, £8.50; **TMS 5100 Talking Board**, GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **DUO-1 64K add-on**, Audio Computers, 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £64 kit, £70 built; **MZ163 RAM expansion boards**, Timedata Ltd, 57 Swallowdale, Basildon, Essex SS15 5BZ, £59.50-76.

APPLE II

Apple Computer (UK) Ltd, Finway Road, Hemel Hempstead, Herts, HP2 7PS

- Apple's microcomputer is a good dual-purpose machine for business and entertainment.

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 40 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8 or 12K
Average Price	£812

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£200-1700
Monitor	Yes	£134
Disc Drives	Yes	£379
Other Languages	Yes	£84-500
Multi-user	Yes	—
Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£26

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Multifunction Card, disc drive**, Independent Computer Engineering Ltd 16/18, Littleton Road, Ashford, Middlesex, TW15 1UQ; **16K RAM Board**, DDP Research & Marketing, 17 Novel Square, Basildon, Essex, SS13 1LP, £75; **U-port, 8 serial interfaces**, U-Microcomputers, Ltd, Winstanley Industrial estate, Long Lane, Warrington, Cheshire, WA2 8PR, £195.

ATARI 400

Atari UK Ltd, PO Box 59, Alpertown Lane, Wembley, Middx.

- This computer started out as a popular games machine primarily in America where it has just topped Apple in the sales stakes. It's graphics are second to none.

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	£199.95

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	£39-79
Multi-user	Yes	—
Capabilities	No	—
BASIC extensions (Toolkits)	Yes	—

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95



ATARI 800

Atari UK Ltd, PO Box 59, Alpertown Lane, Wembley, Middx

- The Atari 800 has two distinct advantages over the 400. It has a typewriter keyboard and larger memory

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output, BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	£599.95

MANUFACTURER'S EXPANSIONS

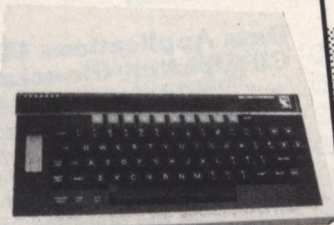
	DETAILS	PRICE
RAM	optional 16K RAM packs (to 48K Max)	£65
Printer	Yes	£265
Monitor	No	—
Disc Drives	Yes	£345
Other Languages	Yes	£39-79
Multi-user	Yes	—
Capabilities	No	—
BASIC extensions (Toolkits)	Yes	TBA

OTHER ADD-ONS:

TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Godinton Road, Ashford, Kent, £82.95; **Carrying case**, CJE Microcomputer, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50

BBC MICROCOMPUTER

**BBC Model A,
BBC Microcomputer
Systems, PO Box 7,
London W3 6JX.**



STANDARD PACKAGE

Memory Size (RAM)	16
Screen Size	32 lines of 40 characters (max)
Expansion Sockets	Parallel serial output, analogue output, Bus connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	£299

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 32K	£100
Printer	TBA	£200
Monitor	Yes	—
Disc Drives	TBA	—
Other Languages	TBA	—
Multi-user	Yes	—
Capabilities	TBA	—
BASIC extensions (Toolkits)	TBA	—

OTHER ADD-ONS:

- Disc drives, single and dual, Cumara Ltd, 35 Walnut Street Close, Guildford, Surrey GU1 4UN, Tel: 0483 50321, £199-799; **BBC Cassette Recorder**, Surrey GU1 4UN, Tel: 0483 50321, £199-799; **BBC Cassette recorder**, Microage Electronics, 135 Hale Lane, Edgware, Middx, £28; **Colour Monitor**, Portatel Conversions Ltd, 25 Sunbury Cross Centre, Staines Road West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit**, Midwich Computer Co Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk IP33 1HQ, £42.50.

BBC MICROCOMPUTER

**BBC Model B
BBC Microcomputer Systems, PO Box 7,
London W3 6JX**

This is a superior version of the Model A and therefore more expensive. The main difference lies in memory capacity — there is 32K on the Model B, and it can handle twice the number of characters on the screen

STANDARD PACKAGE

Memory Size (RAM)	32
Screen Size	30 lines of 80 characters
Expansion Sockets	Serial and parallel output, analogue output, printer BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	£399

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	TBA	—
Monitor	Yes	TBA
Disc Drives	Yes	£200
Other Languages	TBA	TBA
Multi-user	Yes	TBA
Capabilities	—	—
BASIC extensions (Toolkits)	TBA	TBA

OTHER ADD-ONS:

- Disc drives, single and dual, Cumara Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, Tel: 0483 503121, £199-799; **BBC Cassette recorder**, Microage Electronics, 135 Hale Lane, Edgware, Middx, HA8 9QP, £28; **Colour Monitor**, Portatel Conversions Ltd, 25 Sunbury Cross Centre, Staines Road West, Sunbury-on-Thames, Middx, TW16 7BB, £299; **Floppy Disc Controller Kit**, Midwich Computer Co Ltd, Hewitt House, Northgate Street, Bury St. Edmunds, Suffolk, IP33 1HQ, £42.50; **Carrying Case**, CJE Microcomputers, 25 Henry Avenue, Rustington, W. Sussex, BN16 2PA, £18.50.

COMMODORE PET 4000

**Commodore,
675 Ajax Avenue, Slough, Berks**

Commodore's PET 4000 was built on the design of one of the first personal computers brought out by the firm. It is used for a variety of purposes in schools, at home and in the office, but is one of the more expensive microcomputers.

STANDARD PACKAGE

Memory Size (RAM)	16 or 32K
Screen Size	25 lines of 40 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	£632.50, £799.25

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes several	£454-1604
Monitor	N/A	—
Disc Drives	Yes	£396
Other Languages	Yes, single or dual	£454-1029
Multi-user	—	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

- Universal Interface, Technomatic Ltd, 17 Burnley Road, London NW10, £149;
- TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Ashford, Kent, £82.95; **64K DRC Module**, Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

COMMODORE PET 8000

**Commodore,
675 Ajax Avenue,
Slough, Berks**



STANDARD PACKAGE

Memory Size (RAM)	32K or 96K
Screen Size	25 lines of 80 characters
Expansion Sockets	IEEE 488 standard, parallel output
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	£980, £1374

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	—
Printer	Yes various	£454-1604
Monitor	N/A	—
Disc Drives	Yes single or dual	£454-1029
Other Languages	Yes	—
Multi-user	—	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

- Universal Interface, Technomatic Ltd, 17 Burnley Road, London NW10, £149;
- TMS 5100 Talking Board, GM Microtronics Ltd, Unit 14, Godinton Way Industrial Estate, Ashford, Kent, £82.95; **64K DRC Module**, Audio Computers, 87 Bournemouth Park Road, Southend-on-sea SS5 2JJ, £70 kit, £80 built.

COMMODORE VIC20

Commodore,
675 Ajax Avenue, Slough, Berks



STANDARD PACKAGE

Memory Size (RAM)	5K
Screen Size	23 lines of 22 characters
Expansion Sockets	BUS connection, Disc, Printer, Serial output, Joystick
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	£199.99

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	3K, 8K, 16K expansion options	£270
Printer	Yes	—
Monitor	No	£396
Disc Drives	Yes	£38.95
Other Languages	Yes	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

VCR-20, 20K RAM cartridge, Audio Computers, 87 Bournemouth Park Road, Southend on Sea SS5 2JJ, £39 kit, £45 built; Expansion Board, 3K-16K, Arfon Microelectronics Ltd, Gibyn Industrial Estate, Caernafon, Gwynedd, Wales LL55 2BD, £220. Languages: VIC Forth, Adda Computers, 154 Victoria Road, Acton, London, W3.

DAI

Data Applications UK Ltd, 16B Dyer Street,
Cirencester, Gloucestershire, GL7 2PF

For the amount of on-board memory the DAI has it is a good price. But for the enthusiast and computing newcomer there is little off-the-shelf software available. It is aimed more directly at the small business user rather than the first-time buyer or hobbyist.

STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	24 lines of 60 characters
Expansion Sockets	BUS connection, Serial output, joystick socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	£575

MANUFACTURER'S EXPANSIONS

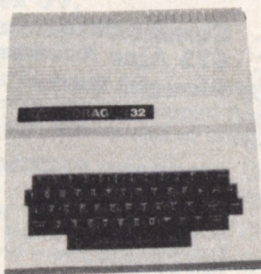
	DETAILS	PRICE
RAM	No	—
Printer	No	—
Monitor	No	—
Disc Drives	No	—
Other Languages	Yes	TBA
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	Yes, maths pack	£149

OTHER ADD-ONS:

None Reported

DRAGON 32

Dragon Data Ltd
Queensway,
Swansea
Industrial Estate,
Swansea, SA5 4EH



STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Yes
Display Unit Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	16K
Average Price	£199

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	—	—
Printer	No	—
Monitor	No	—
Disc Drives	No	—
Other Languages	Yes	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None reported

MICROCONTROLLER

Midwich Computer Company, Ltd,
Hewitt House, Northgate Street,
Bury St. Edmunds, Suffolk IP33 1HQ.
Tel: 0284-701321

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 40 characters
Expansion Sockets	Serial output BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K (control BASIC)
Average Price	£375

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	POA
Printer	Yes	£135-149
Monitor	Yes, 9" or 12" screen	—
Disc Drives	No	—
Other Languages	No	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

NASCOM 3

Lucas Logic, NASCOM
Microcomputers Division, Welton Road,
Wedgenock Industrial Estate, Warwick,
CV34 5PZ.
Tel: 0926-497733

STANDARD PACKAGE

Memory Size (RAM)	0-48K
Screen Size	25 lines of 40 or 80 character
Expansion Sockets	Parallel & serial outputs, BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8-10K
Average Price	£549

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 48K (max)	£130
Printer	Yes	£215-1285
Monitor	Yes	£99-120
Disc Drives	Yes, single or dual	£470-685
Other Languages	Yes	£50
Multi-user	No	-
Capabilities	Yes	-15-50
BASIC extensions (Toolkits)		

OTHER ADD-ONS:

Olivetti disc drives, single and dual, Kram Electronics, Victoria House, 17, Highcross St., Leicester, LE1 4PF, £179-349; A/D Board, 10, Research Ltd, 6, Laleham Avenue, Mill Hill, London NW7 3HL, £120 + VAT; Hobbit - mini-cassette system, Ikon Computer Products, Kiln Lane, Laugharne, Cownthen, Dyfed, E99 + VAT; Disc drives, single and dual, Micro-Spares, 19, Roseburn Terrace, Edinburgh, EH12 5N9, £199-279.

NEC PC8000

IBR, Unit 57,
Sutton Industrial Park,
London Road,
Earley,
Reading,
Berks.

Really only for the small business user.

STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	25 lines of 80 characters
Expansion Sockets	Parallel output Bus Connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	24K
Average Price	£599

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 32K RAM packs (up to 128K)	£109
Printer	Yes	£375-1450
Monitor	Yes	£149-£549
Disc Drives	Yes, dual	£625
Other Languages	Yes	£200-£500
Multi-user		
Capabilities	Yes	
BASIC extensions (Toolkits)	No	P.O.A.

OTHER ADD-ONS:

None Reported

NEWBRAIN

Grundy Business Systems Ltd, Grundy House, Somerset Road, Teddington TW11 8TD.

STANDARD PACKAGE

Memory Size (RAM)	32K
Screen Size	25 lines of 40 or 80 characters
Expansion Sockets	Printer, serial, video, data bus
Tape Included?	No
Display Unit Included?	No (Single line option on model AD)
Usable Domestic TV?	Yes
Size of BASIC	18K
Average Price	£199 model A, £299 Model AD

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	64 - 512K,	£75 - £445
Printer		
Monitor		
Disc Drives	NYA	-
Other Languages	NYA	-
Multi-user	NYA	-
BASIC extensions	NYA	-

OTHER ADD-ONS:

None Reported.

SHARP MZ-80A

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE
Tel: 061-205 2333.



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	£549

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	£450-800
Printer	Yes	-
Monitor	N/A	£600
Disc Drives	Yes, dual	£45
Other Languages	Yes	-
Multi-user Capabilities	No	-
BASIC extensions (Toolkits)	No	-

OTHER ADD-ONS:

None Reported

REFERENCE FACTFILE

SHARP MZ-80B

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE



As cost is often the most relevant factor in buying a computer this Sharp is suited to the dedicated business user who can afford it.

STANDARD PACKAGE

Memory Size (RAM)	64K
Screen Size	25 lines of 40 or 80 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	16K
Average Price	£990

MANUFACTURER'S EXPANSIONS

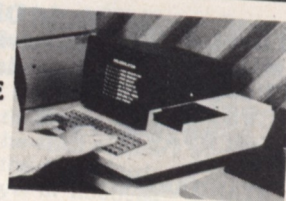
	DETAILS	PRICE
RAM	Yes	£120
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Multi-vision and triple-vision, Datron Micro Centre, 2 Abbeydale Road, Sheffield S7 1FD, £35-79

SHARP MZ-80K

Sharp UK Ltd, Thorn Road, Newton Heath, Manchester M10 9BE



STANDARD PACKAGE

Memory Size (RAM)	48K
Screen Size	25 lines of 40 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	12K
Average Price	£350

MANUFACTURER'S EXPANSIONS

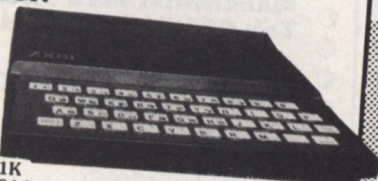
	DETAILS	PRICE
RAM	No	—
Printer	Yes	£450-800
Monitor	N/A	—
Disc Drives	Yes, dual	£600
Other Languages	Yes	£45 upwards
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

SINCLAIR ZX-81

Sinclair Research, 6 Kings Parade, Cambridge, CB2 1SN



STANDARD PACKAGE

Memory Size (RAM)	1K
Screen Size	24 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	£49.95 kit, £69.95 built

MANUFACTURER'S EXPANSIONS

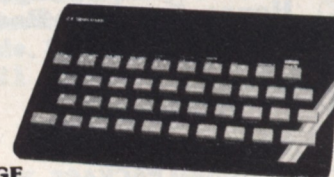
	DETAILS	PRICE
RAM	16K RAM pack	£29.95
Printer	ZX Printer	£59.95
Monitor	No	—
Disc Drives	No	—
Other Languages	No	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Memory expansion unit 16K or 64K, Memotech Ltd, 3 Collins St, Oxford OX4 1XL, £39.95-79; Key Bleep Unit, Microtronix, 3 Buxton Avenue, Coulton, Nottingham, N94 3RR, £8.85 kit, £9.95 built; Maximem 1.1, East London Robotics, Finlandia House, 14 Darwell Close, East Ham, London, E84 BT, £93.50; Music Synthesiser + 16 line control port, William Stuart Systems Ltd, Dower House, Billicicay Road, Herongate, Brentwood, Essex CM13 3SD, £19.50; Full-size keyboard, Protos Computer Systems, Frome Computing, 20 Ashtree Road, Frome, Somerset, BA11 2SF, £64.95; ZX99 Automatic tape control, Data-cassette, 44, Shroton Street, London NW1 6UG, £59.95.

SINCLAIR ZX-SPECTRUM

Sinclair Research, 6 Kings Parade, Cambridge CB2 1SN



Price wise this computer beats everything else.

STANDARD PACKAGE

Memory Size (RAM)	16-48K
Screen Size	24 lines of 32 characters
Expansion Sockets	BUS connections
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	10K
Average Price	£125 or £175

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	48K RAM for 16K version	£60
Printer	ZX Printer	£59.95
Monitor	No	TBA
Disc Drives	ZX Microdrive	—
Other Languages	No	—
Multi-user	No	TBA
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

None Reported

SORCERER

EMG, Microcentre, 47 Lower Belgrave Street, London, SW1

Aimed at the business user this computer can either be linked up to a standard television and tape loaded, or be hooked up to a special unit consisting of a monitor and two 5-inch disc drives. Compatible software is thin on the ground from independent suppliers.

STANDARD PACKAGE

Memory Size (RAM)	56K
Screen Size	30 lines of 64 characters
Expansion Sockets	BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8K
Average Price	£790

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	No	£395-1935
Printer	Yes	£160-330
Monitor	Yes	£420-599
Disc Drives	Yes single and dual	£99-420
Other Languages	Yes	
Multi-user	No	
Capabilities	No	
BASIC extensions (Toolkits)		

OTHER ADD-ONS:

None Reported

TANDY TRS 80 I

Tandy Corporation, 12th Floor, Tameway Tower, Walsall, West Midlands WS1 1LA.

The TRS-80 Model I is slightly old-fashioned because of its graphics limitations, and black and white screen

STANDARD PACKAGE

Memory Size (RAM)	4 or 16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8 or 12K
Average Price	£229 or £339

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	32K extra in expansion unit	£349
Printer	Yes	
Monitor	Yes	£239-1200
Disc Drives	Yes	£100
Other Languages	Yes	£369
Multi-user	Yes	£100
Capabilities	No	
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; Olivetti disc drives single and dual, Kram Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349; 48K internal RAM, General Northern Microcomputers, (GNOMIC) 46 Middle Street, Blackhall, Marlepool, Cleveland, £70 + VAT; 32K RAM card, Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.

TANDY TRS 80 III

Tandy Corporation, 12th Floor, Tameway Tower, Bridge Street, Walsall, West Midlands WS1 1LA

This is the upgraded version of the Model I and comes complete with black and white monitor and dual disc drives.

STANDARD PACKAGE

Memory Size (RAM)	4-48K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connection, parallel & serial output
Tape Included?	No
Display Unit Included?	Yes
Usable Domestic TV?	No
Size of BASIC	16K
Average Price	£599-1799

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	16K modules	£70
Printer	Yes various	£239-1200
Monitor	N/A	
Disc Drives	Yes	£600
Other Languages	Yes	£100
Multi-user	No	
Capabilities	Yes	
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

Disc drives, Cumana Ltd, 35, Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; Olivetti disc drives single and dual, Kram Electronics, Victoria House, 17, Highcross St, Leicester LE1 4PF, £179-349; 48K General Northern Microcomputers, (GNOMIC), 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; 32K RAM card, Audio Computers, 87 Bournemouth Park Road, Southend on Sea, SS5 2JJ, £40 kit, £46 built.

TANDY COLOUR

Tandy Corporation, 12th Floor, Tameway Tower, Bridge Street, Walsall, West Midlands, WS1 1LA

The latest addition to Tandy's range and designed to make up for the faults of earlier models.



STANDARD PACKAGE

Memory Size (RAM)	16-32K
Screen Size	16 lines of 32 characters
Expansion Sockets	Serial output, ROM pack, joystick socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	8-16K
Average Price	£499

MANUFACTURER'S EXPANSIONS

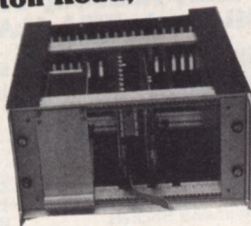
	DETAILS	PRICE
RAM	No	£239-1200
Printer	Yes various	
Monitor	No	£439
Disc Drives	Yes	
Other Languages	No	
Multi-user	No	
Capabilities	No	
BASIC extensions (Toolkits)		

OTHER ADD-ONS:

Olivetti disc drives single and dual, Kram Electronics, Victoria House, 17 Highcross St., Leicester LE1 4PF, £179-349.

TANGERINE MICRON

Tangerine Computer Systems Ltd,
The Science Park, Milton Road, Cambridge
CB4 4BH



STANDARD PACKAGE

Memory Size (RAM)	8K
Screen Size	16 lines of 32 characters
Expansion Sockets	Parallel & serial output, BUS connection
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	10K
Average Price	£395

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	48K in system rack	£144
Printer	No	—
Monitor	No	TBA
Disc Drives	Yes	£40
Other Languages	Yes	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Sound Board and Graphics Board, Bulldog Video Ltd, 52, Nash Square, Birmingham, B42 2EX, £49-£179; **Toolkit,** Microtanic Software, 235, Friern Road, Dulwich, London, OBD, £22.50.

TEXAS TI 99/4A

Texas Instruments,
European
Consumer
Division,
Manton Lane,
Bedford MK41 7PA



STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	24 lines of 32 characters
Expansion Sockets	ROM pack, Bus connector, joystick, socket
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	14K
Average Price	£199

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	up to 48K (max)	£300
Printer	Yes	£275
Monitor	No	—
Disc Drives	Yes	£300
Other Languages	No	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	Yes	£100

OTHER ADD-ONS:

None Reported

VIDEO GENIE I

Lowe Electronics, Bentley Bridge,
Chesterfield Road, Matlock, Derbyshire,
DE4 5LE

The Genie I is the essence a copy of the Tandy TRS-80 and the software is compatible with both machines. Its main drawback is the graphics limitations

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	16 lines of 64 characters
Expansion Sockets	BUS connector
Tape Included?	Yes
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	12K
Average Price	£279

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumara Ltd, 35 Walnut Tree Close, Guildford, Surrey GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213; **48K internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Martlepool, Cleveland, £70 + VAT; **32K RAM Card Audio Computer,** 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.

VIDEO GENIE II

Lowe Electronics, Bentley Bridge,
Chesterfield Road, Matlock, Derbyshire
DE4 5LE

This is the upgraded version of the original Genie I.

STANDARD PACKAGE

Memory Size (RAM)	16K
Screen Size	16 lines of 32 or 64 characters
Expansion Sockets	BUS connector
Tape Included?	No
Display Unit Included?	No
Usable Domestic TV?	Yes
Size of BASIC	13K
Average Price	£299

MANUFACTURER'S EXPANSIONS

	DETAILS	PRICE
RAM	optional 48K in expansion unit	£200
Printer	Yes	£210
Monitor	Yes	£69-99
Disc Drives	Yes, single and dual	£220-375
Other Languages	No	—
Multi-user	No	—
Capabilities	No	—
BASIC extensions (Toolkits)	No	—

OTHER ADD-ONS:

Disc drives, single and dual, Cumana Ltd, 35, Walnut Tree Close, Guildford, Surrey, GU1 4UN, £199-799; **Olivetti disc drives single and dual,** Kram Electronics, Victoria House, 17 Highcross St, Leicester LE1 4PF, £179-349; **EG3014 Expansion box with 16K/32K RAM,** Swanley Electronics, 32 Goldsel Road, Swanley, Kent BR8 8EZ, £199-213; **48K internal RAM,** General Northern Microcomputers, GNOMIC, 46 Middle Street, Blackhall, Hartlepool, Cleveland, £70 + VAT; **32K RAM Card Audio Computers,** 87 Bournemouth Park Road, Southend-on-sea, SS5 2JJ, £40 kit, £46 built.

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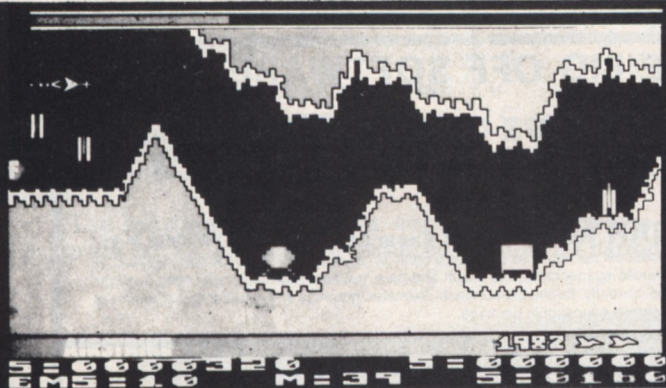
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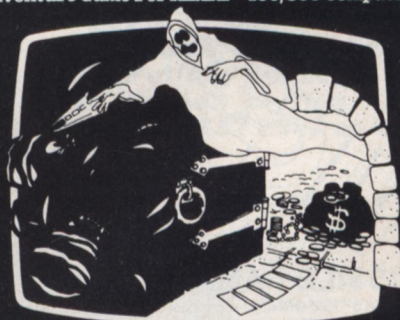
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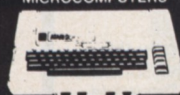
A complete game encompasses 30 rooms and 20 prizes, and prize capture is not always an easy

task; a different technique or twist is involved in obtaining each one. Some require physical dexterity to reach while others can be acquired only through an intellectual problem solving path. Even some rooms are initially hidden from the player and must first be found before their prizes can be captured. Action Quest provides challenges both for fast action players as well as for those motivated by intrigue.

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SOFTWARE LISTING

Looking for a program to buy? Look no further! If it's available, it's listed here in our exclusive and comprehensive software checklists.

Looking through any computer magazine can be a bewildering experience if you're in search of a program. Count the hundreds of ads and thousands of titles on sale and it would be easy to lose heart!

We've tried to sort out the confusion, and the sheer numbers, to present an easily understood list for each machine. Where possible, we have eliminated duplications, so that the same tape with a different label is not listed twice. Rather it should be credited once, with as many suppliers as we could find.

Table Codes

In order to fit as many programs as possible into our pages, we have had to use codes for some columns, considerably shortening the wording.

The information given for each program is: Title, memory required

to run it, company producing it, whether tape/cartridge or disk, type and supplier and price.

The codes we have used are:

Program Type

- GM = Game
- BS = Business routine
- UT = Utility (ie. programming aid)
- DO = Domestic
- ED = Educational

How Sold

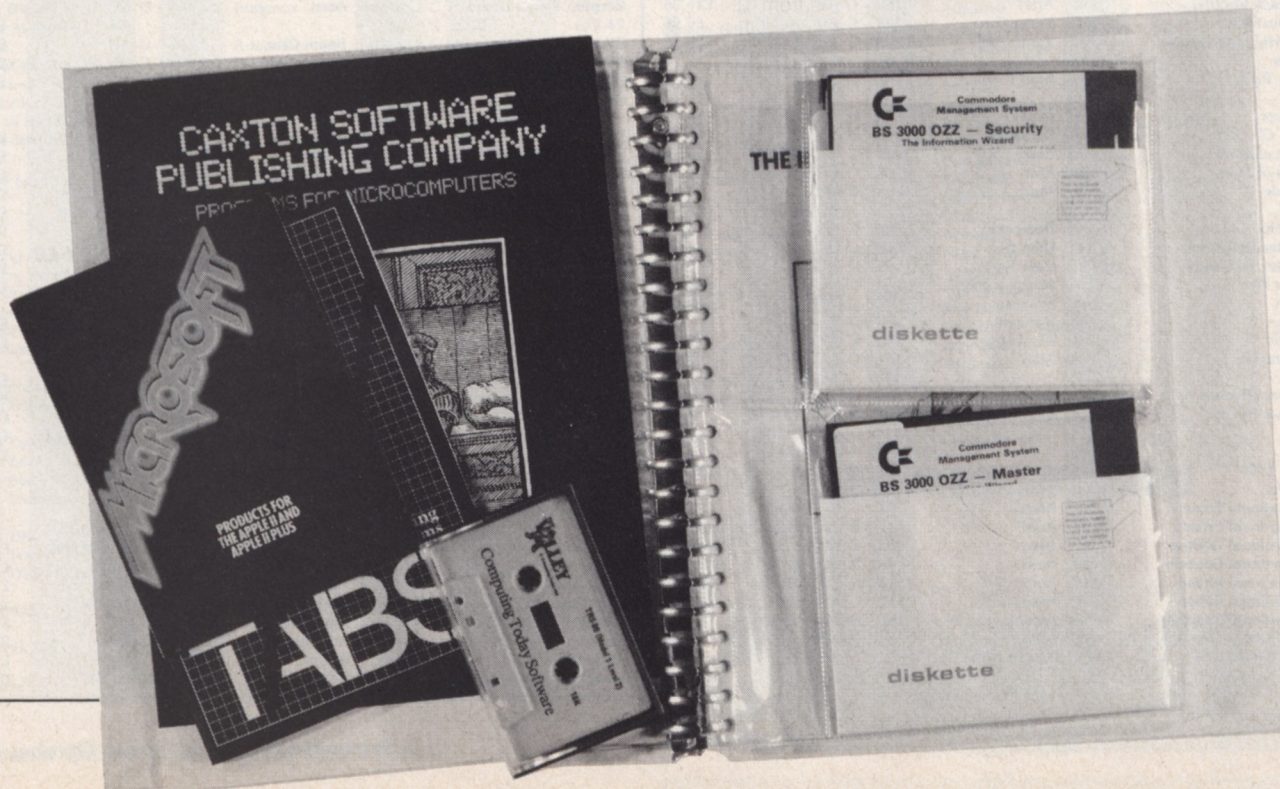
- R = Cartridge (may include memory)
- C = Tape (cassette)
- D = Disc (for expanded systems)
- L = Listing (sold as print-out)

These tables are repeated throughout the listings to save you having to

turn back and forth repeatedly. Once you've found the program you want, check the supplier code with the list of companies at the end of the article for address and telephone number.

Not Here?

To companies whose products are not listed herein we can only say **TELL US ABOUT IT!** This applies particularly to the smaller retailer who may sell only half a dozen or so programs for one machine. If you produce software for any of the machines on the market today, then we would love to include your wares in our checklists. Send it in to us, marked for the attention of the Editor (in our format *Please!*) or ring Chris Palmer on 01-437 1002 as soon as possible.



REFERENCE

SOFTWARE LISTING

ATARI 400

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3-D Supergraphics	Ut	United S/W of America	48K	C BC		£29.95
3-D Supergraphics	Ut	United S/W of America	48K	D AB		£39.95
6502 Disassembler	Ut	Quality S/W	16K	C BC		£8.95
6502 Disassembler	Ut	Quality S/W	16K	D BC		£11.95
747 Landing Simulation	Gm	Atari	24K	C GC	POA	
Adventureland	Gm	Adventure Int.	24K	C BC	AB,IK	£16.75
Action Quest	Gm	J.V. S/W	16K	C HM	AB	£14.95
Action Quest	Gm	J.V. S/W	16K	D HM	AB	£16.50
Adventures 1-12	Gm	Adventure Int.	32K	C CH		£19.95
Air Strike	Gm	English S/W	16K	C CH,HM		£15.95
Ali Baba	Gm	Quality S/W	32K	D HM		£22.95
Alpha Fighter	Gm	Dinacomp	24K	C AB,IK		£11.99
Analog Adventure	Gm		32K	D BC		£34.95
Angle Worms	Gm	Adventure Int.	8K	C AB,IK		£12.50
Ants Hill	Gm	Atari	8K	C GC	POA	
Armoured Patrol	Gm	Adventure Int.	16K	C AB		£11.25
Assembler Editor	Ut	Atari		R AB,HM		£16.50
Assembler	Ut	Quality S/W	16K	C BC		£39.95
Assembler Editor	Ut	United S/W of America	16K	R BC		£14.95
Asteroids	Gm	Atari	16K	R AC, BC,CH, HM,IK		£34.50
Atari Word Processor	Bs	Atari	32K	C AB		£29.95
Atari Word Processor	Bs	Atari	32K	C BC		£18.95
Atari Word Processor	Bs	Atari	32K	D HM		£95.95
Atari World Graphics	Ut	United S/W of America	48K	D BC		£85.00
Avalanche	Gm	Atari	16K	C GC	CH	£99.95
Babel	Gm	Atari	16K	C GC	AB,IK	£43.95
Balrog Sampler	Gm	Adventure Int.	32K	C AB		POA
Basic A Plus	Ut	OSS S/W	48K	D BC		£13.95
Basic A Plus and Operating System A	Ut	OSS S/W	48K	D BC		£16.75
Basic Program Compress.	Ut	Atari	32K	D AB		£16.75
Basic Utility/Renumber	Ut	Atari	16K	C AB		£24.95
Basics of Animation	Ed	Santa Cruz	24K	D BC		£52.50
Basics of Animation	Ed	Atari	16K	C BC		£99.50
Basics of Animation	Ed	Santa Cruz	16K	C AB		£16.75
Basketball	Gm	Atari	16K	C AC,HM,IK		£24.95
Basketball	Gm	Atari	16K	R AB,BC,IK		£29.95
Beneath the Pyramids	Gm	Chrystal	48K	C CH,AB,IK		£19.99
Black Jack	Gm	Atari	16K	C GC	AC,BC	£9.95
Black Jack Shooter	Ed	Atari	16K	C AB	AB,HM,IK	£16.75
Bob's Business	Bs	Santa Cruz	16K	C AB		£9.95
British Heritage Jigsaw Puzzle	Gm	Thorn EMI	16K	C BC,HM,IK		£19.95
Bumper Pool	Gm	Atari	16K	C GC,IK	AB	£11.25
Calculator	Bs	Atari	24K	D BC,IK		£16.95
Canyon Climber	Gm	Datasoft	16K	D HM		£20.00
Caverns of Mars	Gm	Atari	16K	C BC,HM,IK		£24.50
Caverns of Mars	Gm	Atari	16K	C BC,HM,IK		£24.50
Centipede	Gm	Atari	16K	R GC	POA	
Champelo	Gm	Dinacomp	16K	C AB,IK	BC,HM,IK	£29.95
Character Generator	Ut	Data Soft	16K	C BC		£10.99
Character Generator	Ut	Data Soft	16K	D BC		£9.97
Checker Kim	Gm	Personal S/W	16K	C BC		£12.50
Chicken	Gm	Synapse	16K	C HM		£15.95
Chicken	Gm	Synapse	16K	D		£19.95
Chrystals	Gm	Dinacomp	24K	C AB,IK		£9.99
Code Cracker	Gm	Atari	8K	C GC	POA	
Computer Acquire	Gm	Avalon Hill	16K	C GB	AB	£11.25
Computer Chess	Gm	Atari	16K	R GC	CH,AC,HM	£17.25
Conflict 2500	Gm	Avalon Hill		C GB,AB		£24.95
Controller	Gm	Avalon Hill	32K	D BH		£12.50
Conversational French	Ed	Atari	16K	C AC,BC,IK		£17.95
Conversational French	Ed	Atari	16K	R AB,HM,IK		£32.50
Conversational German	Ed	Atari	16K	C AC,BC,IK		£39.95
Conversational German	Ed	Atari	16K	R AB,HM,IK		£32.50
Conversational Italian	Ed	Atari	16K	R AB,HM,IK		£39.95
Conversational Italian	Ed	Atari	16K	C AC,BC,IK		£32.50
Conversational Spanish	Ed	Atari	16K	R AB,HM,IK		£39.95
Conversational Spanish	Ed	Atari	16K	C AC,BC,IK		£32.50
Convoy Raider	Gm	Avalon Hill	16K	C BH	GB,AB	£10.95
Cribbage and Dominoes	Gm	Thorn EMI	16K	C CH,BC,HM,IK		£14.95
Cross Fire	Gm	On Line	16K	C HM		£19.95
Cross Fire	Gm	On Line	32K	D HM		£19.95
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	C GB,IK		£15.50
Crush, Crumble, Chomp	Gm	Avalon Hill	16K	D GB,IK		£17.95
Crypts of Terror	Gm	In Home S/W	16K	C CH,HM		£19.95
Curse of Crawley Manor	Gm	Adventure Int.	16K	C AB		£16.50
Cypher Bowl	Gm	Artsci Inc.	32K	D BC		£22.45
DI Nuclear Bomber	Gm	Avalon Hill	16K	C BH		£10.95
Darts	Gm	Thorn EMI	16K	C CH,BC,HM,IK		£19.95
Data Management S/W	Bs	C E S/W	48K	D AB		£101.00
Data Management System	DO	Atari	32K	D AB		£20.50
Datestone of Ryn	Gm	Avalon Hill		D GB,IK		£15.50
Datestone of Ryn	Gm	Avalon Hill		C BC		£14.95
Deflections	Gm	Adventure Int.	8K	C AB,IK		£13.50
Disc Fixer	Ut	Atari	16K	D AB		£12.50
Display List	Ed	Santa Cruz	16K	C BC		£22.50
Display List	Ed	Santa Cruz	16K	D BC		£9.95
Dnieper River	Gm	Avalon Hill	48K	C BH		£10.95
Domination	Gm	Atari	24K	C GC	POA	£14.50
Dos 2	Ut	Atari	32K	D AB		£16.75
Dragon of Hong Kong	Gm	Adventure Int.	32K	C AB		£21.95
Eastern Front	Gm	Atari	16K	C CH		£16.50
Eastern Front	Gm	Atari	16K	D AB		£24.95
Empire of the Overmind	Gm	Avalon Hill		C BH		£30.25
Empire of the Overmind	Gm	Avalon Hill		CH		£17.95
Escape from Tramm	Gm	Adventure Int.	16K	C AB		£18.95
European Capitals	Ed	Atari	16K	C AC,BC	AB,HM,IK	£24.95
European Scene Jigsaw Puzzle	Gm	Thorn EMI	16K	C BC,HM,IK		£8.95
Extended WSNA	Ut	Atari	16K	C AB		£19.95
Fantasy land 2041	Gm	Chrystal	48K	C CH,AB,IK		£9.00
Fastgammon	Gm	Quality S/W	16K	C BC		£34.99
Forest Fire	Gm	Dinacomp	24K	C AB,IK		£9.95
Frog	Gm	C E S/W	16K	C AB		£22.95
Frogger	Gm	On Line	16K	C HN		£22.95
Frogger	Gm	On Line	32K	D HN		£15.99
Galactic Chase	Gm	Spectrum	16K	C AB,BC,HM		£20.25
Galactic Chase	Gm	Spectrum	16K	D AB		£17.95
Galactic Chase	Gm	Spectrum	16K	D BC,HM		£14.95
Galactic Empire	Gm	Adventure Int.	32K	C BC	AB,IK	£16.50
Galactic Guest	Gm	Chrystal	48K	C CH,AB,IK		£19.99
Galactic Trader	Gm	Adventure Int.	32K	C AB,CH,IK		£16.50
Galaxy	Gm	Avalon Hill	16K	C BH		£12.95
Galaxy	Gm	Avalon Hill	16K	D BH		£14.95
Ghost Hunter	Gm	Arcade Plus	16K	C HM		£19.95
Ghost Hunter	Gm	Arcade Plus	16K	D HM		£22.95
Ghost Town	Gm	Adventure Int.	24K	C BC	AB,IK	£16.50
Giant Slalom	Gm	Dinacomp	16K	C AB		£11.99
Golden Voyage	Gm	Adventure Int.	24K	C BC	AB	£14.95
Gomoku	Gm	Artsci Inc	16K	C BC		£16.50
Graph it	Ut	Atari	16K	C AC,BC,IK	AB,HM	£14.95
Graphic Sound Demo	Gm	Atari	16K	D GC	POA	£13.95
Graphics Machine	Ut	Santa Cruz	16K	C AB		£16.75
Guns of Fort Defiance	Gm	Avalon Hill	32K	C BH		£13.50
HMS Impetuous	Gm	Adventure Int.	32K	C AB		£12.95
Hangman	Gm	Atari	16K	C AC,BC		£16.50
Hickory Dickory Dock	Gm	Thorn EMI	16K	C BC,HM,IK		£8.95
Home Financial Mg'ment	Dm	Thorn EMI	16K	D HM		£9.95
Horizontal/Vertical Scrolling	Ed	Santa Cruz	16K	C AB		£19.95
House of Usher	Gm	Chrystal	48K	C AB,CH,IK		£19.99
Humpty Dumpty/Jack & Jill	Gm	Thorn EMI	16K	C BC,HM,IK		£19.95
Intruder Alert	Gm	Dinacomp	16K	C AB,IK		£15.99
Invasion Orion	Gm	Avalon Hill		C GB,IK		£13.25
Invasion Orion	Gm	Avalon Hill		D GB,IK		£15.75
Invitation to Prog I	Ed	Atari	16K	C AB,HM,IK		£15.95
Invitation to Prog. II	Ed	Atari	16K	C GC,IK	POA	£22.95
Invitation to Prog. III	Ed	Atari	16K	C AB,BC,HM,IK		£22.95
Jawbreaker	Gm	On Line	16K	C HM		£19.95
Jawbreaker	Gm	On Line	32K	D HM		£19.95
Jawbreaker	Gm	On Line	48K	D BC,IK		£22.95
Jumbo Jet Lander	Gm	Thorn EMI	16K	C BC,HM,IK		£29.95
K Dos	Ut	K Bite	32K	D BC		£53.95
Kids I	Ed	Santa Cruz	16K	C AB		£9.95
Kids II	Ed	Santa Cruz	16K	C AB		£9.95
Kingdom	Gm	Atari	16K	C AC,BC		£8.95
Krazy Shoot Out	Gm	K Bite	16K	C BC,CH,HM		£9.95
Lazerwords	Gm	Chrystal	16K	C AB		£29.95
Letter Writer	Bs	C E S/W	16K	C AB		£19.99
Little Chrystal	Gm	Chrystal	48K	C AB,AB		£19.95
Little Red Riding Hood	Gm	Adventure Int.	16K	C CH		£26.99
Local Call for Death	Gm	Adventure Int.	32K	C AB		£12.50
Lords of Karma	Gm	Avalon Hill	48K	C CH,BH		£16.50
Lords of Karma	Gm	Avalon Hill	48K	D CH,BH		£12.95
Lords of Karma	Gm	Avalon Hill	48K	D CH,BH		£14.95

Lunar Lander	Gm	Adventure Int.	16K	C	AB,IK	£16.50
Macro Assembler	Ut	Atari	32K	R	BC,HM	£59.95
Matchmaker	Gm	Adventure Int.	16K	C	AB	£12.50
Micro Chess	Gm	Personal S/W	16K	C	BC	£15.95
Microsoft Basic	Ut	Atari		C	AB,BC,HM	£59.95
Midway Campaign	Gm	Avalon Hill	32K	C	AB	£12.50
Mind Bogglers	Gm	Versa Computing	16K	C	BC	£8.95
Mini Wordprocessor	Ed	Santa Cruz	32K	C	AB	£9.95
Minotaur	Gm	Atari	24K	C	GC	POA
					AB	£11.25
Missile Command	Gm	Atari	16K	R	BC,AC,CH	
					HM,IK	£29.95
Mission Asteroid	Gm	On Line	40K	D	HN	£17.95
Mission Impossible	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Monarch	Gm	Dinacomp	16K	C	AB,IK	£10.99
Moon Probe	Gm	Dinacomp	16K	C	AB,IK	£9.99
Mortgage Loan Analysis	Ed	Atari	16K	C	AB,BC,HM	£13.95
					IK	
Mountain Shoot	Gm	Adventure Int.	16K	C	AB	£16.50
Mountain Shoot	Gm	Analog S/W	16K	C	BC	£10.95
Mouskattack	Gm	On Line		D	CH,IK	£22.95
Movie Scenes	Gm	Atari	16K	C	BC	£9.95
Moving Maze	Gm	Dinacomp	16K	C	AB,IK	£9.99
Murder at Awesome Hall	Gm	Channel 8 S/W	16K	C	HN	£12.95
Music Composer	Gm	Atari	16K	R	AC,BC	£32.50
					AB,HM,IK	£35.95
Mystery Funhouse	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Nautilus	Gm	Synapse	32K	C	HM	£20.00
Nomino's Jigsaw	Gm	Dinacomp	24K	C	AB,IK	£15.99
Norton Forth	Gm	Adventure Int.	32K	C	AB	£24.95
Nuke War	Gm	Avalon Hill	16K	C	BH	£10.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C	AB	£12.50
Operating System A Plus	Ut	OSS S/W	48K	D	BC	£52.50
Outlaw Howitzer	Gm	Atari	24K	C	GC	POA
					AB	£16.75
Pacific Coast Highway	Gm	Datasoft	16K	C	HN	£20.00
Pacific Coast Highway	Gm	Datasoft	16K	D	HN	£20.00
Pac-Man	Gm	Atari	16K	R	GC,IK	POA
					BC,HM	£29.95
Page Flipping	Ed	Santa Cruz	16K	C	BC	£9.95
Page Flipping	Ed	Santa Cruz	16K	D	BC	£10.95
Personal Finance	Gm	Atari		R	BC,HM,IK	£49.00
Pilot (Educator)	Ut	Atari	16K			
					C/R AB,BC,HM	£79.95
Pirate Adventure	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Planet Miners	Gm	Avalon Hill	24K	C	BH	£10.95
Player Missile Graphics	Ed	Santa Cruz	24K	D	BC	£19.95
Player Missile Graphics	Ed	Santa Cruz	24K	C	BC	£18.95
					AB	£19.95
Poker & Solitaire	Gm	Artsci Inc.	16K	C	BC	£10.95
Program Pack I	Ut	Avalon Hill	16K	C	GB	£3.50
Protector	Gm	Synapse	32K	C	HN	£19.95
Purchase Ledger	Bs	Atari	48K	C	AB,IK	£149.95
Pyramid of Doom	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
QS Forth	Ut	Quality S/W	24K	D	BC	£44.90
Quest for Power	Gm	Chrystal	48K	C	CH,AB	£26.99
Race in Space	Gm	Analog S/W	16K	C	BC	£14.95
Race in Space	Gm	Analog S/W	16K	C	HN	£15.95
Race in Space	Gm	Analog S/W	16K	D	HN	£15.95
Raster Blaster	Gm	Budgeco	32K	C	HN	£22.95
Rescue at Rigel	Gm		32K	C	BC,IK	£22.45
Reversi	Gm	Artsci Inc	16K	C	BC	£14.95
Rings of the Empire	Gm	Dinacomp	16K	C	AB,IK	£15.99
Rotate and Tilt	Gm	Thorn EMI	16K	C	BC,HM	£14.95
Sales Ledger	Bs	Atari	48K	C	AB,IK	£149.95
Sands of Mars	Gm	Chrystal	48K	C	CH,AB,IK	£26.99
Savage Island I	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50
Savage Island II	Gm	Adventure Int.	24K	C	BC	£14.95
					AB,IK	£16.50
Scram	Gm	Atari	16K	C	GC,IK	POA
					AB,CH,HM	£17.50
Shooting Arcade	Gm	Datasoft	16K	C	HM	£20.00
Shooting Arcade	Gm	Datasoft	16K	D	HM	£20.00
Shooting Gallery	Gm	Analog S/W	16K	C	BC	£15.95
Shooting Gallery	Gm	Analog S/W	16K	D	BC	£15.95
Six Microstories	Gm	Adventure Int.	32K	C	AB	£12.50
Sky Warrior	Gm	Adventure Int.	16K	C	AB	£16.50
Slime	Gm	Synapse	16K	C	HM	£20.00
Snooker and Billiards	Gm	Thorn EMI	16K	C	BC,HM,IK	£19.95
Sound Editor	Gm	Atari	16K	C	GC	POA
					AB	£16.75
Sound Tutorial	Ed	Santa Cruz	16K	C	AB	£13.95
Space Ace	Gm	London S/W	16K	C	HM	£19.95
Space Ace	Gm	London S/W	16K	D	HM	£19.95
Space Invaders	Gm	Atari	16K	R	AB,CH,H-	
					M,BC,IK	
Space Tilt	Gm	Dinacomp	16K	C	AB,IK	£29.95
Space Trap	Gm	Dinacomp	24K	C	AB,IK	£9.99
Space Trek	Gm	Atari	24K	C	GC	POA
					AB	£13.50
Star Raiders	Gm	Atari	16K	R	HM,AC,BC	
					CH,IK	£29.95
Star Trek 3.5	Gm	Adventure Int.	32K	C	BC	£14.95
					AB	£16.50
Star Warrior	Gm	Epyx	32K	C	BC,IK	£28.95

States and Capitals	Ed	Atari	16K	C	AC,BC,IK	£8.95
					AB,HM	£9.95
Statistics I	Gm	Atari		C	AC,BC,IK	£11.95
					AB,HM	£13.95
Stock and Bonds	Gm	Avalon Hill	32K	C	BH	£12.95
Stone of Sisythus	Gm	Adventure Int.	32K	C	AB	£24.95
Strange Odyssey	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50
Stud Poker	Gm	Dinacomp	16K	C	AB,IK	£10.99
Submarine Commander	Gm	Thorn EMI	16K	C	BC,HM,IK	£24.50
Summer	Gm	Chrystal	16K	C	AB	£11.99
Sunday Golf	Gm	Adventure Int.	16K	C	AB,IK	£16.50
Super Breakout	Ut	Atari	16K	C	AC,HM,IK	£24.50
Super Breakout	Gm	Atari	16K	R	AB,IK	£35.95
Tack Trek	Gm	Atari	24K	C	GC	POA
					AB	£13.50
Tank Trap	Gm	Quality S/W	16K	C	BC	£8.95
Tank Trap	Gm	Quality S/W	16K	D	BC	£11.95
Tanktics	Gm	Avalon Hill	32K	C	CH	£16.95
Tari Trek	Gm	Quality S/W	16K	C	BC	£8.95
Tari Trek	Gm	Quality S/W	16K	D	BC	£11.95
Tele Link	Gm	Atari	16K	R	HM,IK	£21.50
Tele Link	Ut	Atari	16K	R	AB,IK	£19.95
Telelink	Ut	Data Soft	16K	R	BC,IK	£14.95
Terrie	Gm	Atari	32K	C	GC	POA
					AB	£16.75
Text Wizard	Ut	Data Soft	16K	D	AB	£99.95
The Count	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50
Threshold	Gm	On-Line	32K	C	HM,IK	£24.95
Thunder Island	Gm	Analog S/W	16K	C	BC	£10.95
Touch Typing	Ed	Atari	16K	C	AC,BC,IK	£14.95
					AB,HM	£15.95
Tournament Pool and						
8 Ball Pool	Gm	Thorn EMI	16K	C	CH,BC,HM	£19.95
					IK	
Track Attack	Gm	Broadband	32K	D	HM	£32.95
Triple Blockade	Gm	Dinacomp	16K	C	AB,IK	£12.99
Tumble Bugs	Gm	Datasoft	24K	D	HM	£19.95
Two Heads of the Coin	Gm	Adventure Int.	32K	C	AB	£16.50
Ulysses	Gm	On-Line	40K	D	HM	£24.95
Video Easel	Gm	Atari	16K	R	GC,IK	POA
					AB,BC,HM	£24.50
Visicalc	Bs	Personal S/W	32K	D	BC,IK	£119.95
Voodoo Castle	Gm	Adventure Int.	24K	C	BC,IK	£14.95
					AB	£16.50
Voyager	Gm	Avalon Hill	32K	C	CH,BH	£12.95
Waterloo	Gm	Chrystal	48K	C	CH,IK	£32.99
Wizard and the Princess	Gm	On Line	48K	D	CH,IK	£22.95
World War III	Gm	Chrystal	48K	C	CH,AB,IK	£19.99

BBC

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Algebraic Manipulation	Ut	Acornsoft	16K	C	AL,GA	£9.95
Asteroid Belt	Gm	Electronics Applied	16K	C	IF	£4.50
Bounty Pirates	Gm	Aztec S/W	16K	C	IB	£5.50
Characters	Ut	Computer Concepts	16K	C	GJ	£6.67
Characters & Envelope	Ut	Electronics Applied	16K	C	IF	£4.50
Definer	Gm	Computer Concepts	16K	C	GJ	£6.67
Code Race	Ut	Acornsoft	16K	C	AL,GA	£9.95
Creative Graphic Pack	Ed	Aztec S/W	16K	C	IB	£6.50
Crossed Words	Bs	Computercat	16K	C	IJ	£11.95
Database	Bs	Acornsoft	16K	C	AL	£9.95
Desk Diary	Gm	A&F Software	16K	C	GE	£6.00
Early Warning	Gm	Program Power	32K	C	GK	£7.99
Eldorado Gold	Bs	Acornsoft	16K	C	AL,GA	£9.95
Graph and Charts Pack	Gm	Aztec S/W	16K	C	IB	£5.50
Hangman	Bs	Acornsoft	16K	C	AL,GA	£16.85
Lisp	Gm	A&F Software	16K	C	GE	£6.00
Minefield	Bs	Bug Byte	16K	C	EA	£25.00
Multifile	Gm	Computer Concepts	16K	C	GJ	£8.95
Othello	Bs	Acornsoft	16K	C	AL,GA	£9.95
Peeko Computer	Ut	Acronsoft	32K	C	AL,GA£16.85	
Lisp	Gm	Aztec S/W	16K	C	IB	£6.50
Mission Impossible	Gm	Acornsoft	32K	C	AL,GA	£9.95
Monsters	Gm	Computer Concepts	32K	C	GJ	£8.95
Othello	Gm	Computercat	16K	C	IJ	£8.95



REFERENCE

SOFTWARE LISTING

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Peeko Computer	Ut	Acornsoft	32K	C	AL,GA	£9.95
Philosopher's quest	Gm	Acronsoft	32K	C	AL,GA	£9.95
Princess	Gm	Aztec S/W	16K	C	IB	£6.50
Snake	Gm	Computer Concepts	32K	C	GJ	£6.67
Snapper	Gm	Acornsoft	32K	C	AL,GA	£9.95
Space Warp	Gm	Bug Byte	32K	C	GA,EA	£11.50
Squash	Gm	Aztec S/W	16K	C	IB	£5.50
Teacher's Toolkit	Ed	Wida Software	32K	C	FY	£30.00
Touch Typist	Ed	Computercat	16K	C	IJ	£9.95
Towns of Britain	Ed	Aztec S/W	16K	C	IB	£6.50
Wordwise	Gm	Computer Concepts	32K	C	GJ	£74.75
Valley, The	Gm	CT Software	32K	C	PF	£9.95
Algebraic Manipulation	Ut	Acronsoft	32K	C	AL,GA	£9.95
Backgammon	Ut	Bug Byte	32K	C	EA	£8.00
Characters	Ut	Computer Concepts	32K	C	GJ	£6.67
Chess	Gm	Bug Byte	32K	C	EA	£11.50
Code Race	Ut	Computer Concepts	32K	C	GJ	£6.67
Creative Graphics	Ut	Acornsoft	32K	C	AL,GA	£9.95
Defender	Gm	Acronsoft	32K	C	AL,GA	£9.95
Desk Diary	Bs	Acornsoft	32K	C	AL,GA	£9.95
FORTH	Ut	Acornsoft	32K	C	AL	£16.85
Golf	Gm	Bug Byte	32K	C	GA,EA	£7.00
Graph and Charts Pack	Bs	Acronsoft	32K	C	AL,GA	£9.95
Double Precision Basic	Ut	Sharp	48K	D	AX	£46.00
Drunken Driver	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Dybug	Ut	Kuma		C	AX	£16.65
Editor Assembler	Ut	Sharp	48K	C	AB	£15.50
Editor Assembler	Ut	Sharp	48K	D	AX	£51.75
Election '84	Gm	Sharpsoft	20K	C	CH	£8.45
Electronic Organ	Gm	Kuma	12K	C	AX	£6.32
Electrons I	Ed	Kuma		C	AX	£12.00
Electrons II	Ed	Kuma		C	AX	£12.00
Empire II	Gm	Sharpsoft	20K	C	AB	£5.85
Enigma	Gm	Kuma	12K	C	AX	£6.32
Escape Forth	Gm	J Wolstencroft	24K	C	CZ	£4.60
Evasion	Gm	Kuma	6K	C	AX,AO	£6.32
Executive	Gm	Kuma	6K	C	AX,AB	£9.20
Exploring Africa	Gm	Kuma	6K	C	AX,AB	£6.32
F DOS	Ut	Sharp	48K	C	AB	£57.50
Fall Out	Gm	Kuma	6K	C	AX,AO	£6.32
Fireballs	Gm	Kuma	6K	C	AX,AB	£6.32
Football Manager	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Forth	Ut	Kuma		C	AX	£40.20
Foundry Package	Bs	Microtek	48K	C	EQ	POA
Four in a Row	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Fox and Geese	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Fruit Machine	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Full Accounting	Bs	Microtek	48K	C	EQ	POA
Guess Word	Gm	Kuma	6K	C	AX,AB	£6.32
Hangman	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Head On	Gm	Highlight S/W	10K	C	CC,AB	£6.90
Head On	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Head On	Gm	Sharpsoft	20K	C	CH	£5.85
Hissing Sid	Gm	Kuma		C	AX	£6.32
Home Budget I	Do	Kuma	6K	C	AX,AC,AO,AB	£6.32
Hunter Killer	Gm	Kuma	48K	C	AX,AB	£6.32
I Spy	Ed	Highlight S/W	22K	C	CC	£5.75
Instant Addition And The Four	Ed	Kuma		C	AX	£6.32
Rules	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Intruder	Gm	Kuma	20K	C	FZ	£6.30
Invaders	Gm	Kuma	48K	C	AX,AB	£6.32
J S Line 4	Gm	Kuma		C	AX	£6.32
Junior Maths and Stepping	Ed	Kuma		C	AX	£6.32
Stones	Gm	Sharpsoft	20K	C	AB	£5.85
Juniori	Gm	Kuma		C	AX	£6.32
Kentucky Derby	Ut	Knights	48K	C	AX	£28.75
Knights Commander	Ut	Knights	48K	D	AX	£74.75
Knights Commander	Ut	Knights	48K	C	AX	£34.50
Knights Fortran	Ut	Knights	48K	C	AX	£23.00
Knights Wee Pascal	Ut	Knights	48K	C	AX	£6.32
Large Display	Gm	Kuma	20K	C	AB	£5.85
Las Vegas	Gm	Sharpsoft	20K	C	AB	£9.20
Life	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Lunar	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Lunar Lander	Gm	Kuma	48K	C	AX,AO,AB	£6.32
MZ Othello	Gm	Kuma	48K	C	AX	£12.00
Madness	Gm	J Wolstencroft	24K	C	CZ	£4.60
Maniac	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Map of England	Gm	Kuma	48K	C	AO	£6.32
Map of England	Gm	Kuma	48K	D	AX	£12.00
Mastermind	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Mastermind	Gm	Kuma	48K	C	AX,AO,FZ,AB	£6.32
Match the Character	Ed	Highlight S/W	22K	C	CC,AB	£4.60
Match the Word	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Maths	Ed	Highlight S/W	22K	C	CC	£5.75
Melody	Gm	Kuma	48K	C	AX	£6.32
Memory Tests	Ut	Kuma	20K	C	AX,AO,AB	£6.32
Minefield	Gm	Kuma	48K	C	AX	£6.32
Miz-Maze	Gm	Kuma	48K	C	AX,AO	£6.32
Monkey Climb	Gm	Kuma	48K	C	AX,AO	£6.32
Moonlander	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Mortar Attack	Gm	Kuma	48K	C	AX,AO	£6.32
Music Composer/Editor	Ed	Kuma	48K	C	AX,AC,AB	£12.00
Narper	Ed	Kuma		C	AX	£28.70
Newton/Conservation	Ed	Kuma		C	AX	£12.00
Pac Man	Gm	Kuma		C	AX	£9.20
Pascal	Ut	Sharp	48K	C	AB	£34.50
Patience	Gm	Kuma	48K	C	AX,AO	£6.32
Payroll	Bs	Microtek	48K	C	EQ	£65.00
Payroll	Bs	Tridata	48K	D	ID	£170.00
Picture Count	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Pilot	Ut	Kuma		C	AX	£17.25
Poker	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Pontoon	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Poseidon	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Princess & Monster Maze	Gm	Kuma	48K	C	AX,AB	£6.32
Program Filing Index	Bs	Kuma	20K	C	AX	£6.32
Quadrax	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Quest	Gm	J Wolstencroft	48K	C	CZ	£4.60
Race Track	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Racing	Gm	Kuma	48K	C	AX	£6.32
Raider	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Reactor	Gm	Kuma	48K	C	AX,AB	£6.32
Rhymes	Gm	Kuma	48K	C	AX,AB	£6.32
Road Hunter	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Rocket	Ed	Kuma		C	AX	£6.32
Semi Conductors I	Ed	Kuma		C	AX	£12.00
Semi Conductors II	Ed	Kuma		C	AX	£12.00
Shape Match	Gm	Kuma	48K	C	AX,AO	£6.32
Shapes	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Sharp Demo	Gm	Kuma	48K	C	AX,AO	£6.32
Show Jumping	Gm	Kuma	48K	C	AX,FZ	£6.32
Shudo	Gm	Kuma	48K	C	AX	£6.32
Simon	Gm	Kuma	48K	C	AX	£6.32

SHARP MZ-80K

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3-D Basic	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Address Book	Gm	Highlight S/W	4K	C	CC,AB	£4.60
Aladdin's Cave	Gm	Kuma		C	AX,CH	£6.32
Aldebaran I	Gm	Sharpsoft	20K	C	CH	£5.85
Alien Attack	Gm	J Wolstencroft	24K	C	CZ	£4.60
Analysis Book	Bs	Microtek	48K	C	EQ	£95.00
Animate	Gm	Kuma	48K	C	AX,AB,AO	£9.20
Apollo Front Panel	Bs	Kuma	20K	C	AX	£14.35
Apolloword	Bs	Kuma	48K	C	AX,AC,AO	£28.70
Apolloword	Bs	Kuma	48K	D	AX,AC,AO	£63.25
Ardensoft Toolkit	Ut	Kuma	20K	C	AX	£40.25
Asteroids	Gm	Sharpsoft	20K	C	CH	£5.85
Astro Dodge	Gm	Kuma		C	AX,CH	£6.32
Auto Cross	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Backgammon	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Bank Account	Do	Highlight S/W	6K	C	CC,AB	£4.60
Basic Compiler	Ut	Sharp	48K	C	AB	£34.50
Basic Extensions	Ut	Kuma	20K	C	AX,AO,AB	£14.95
Basic Plus	Ut	Kuma		C	AX	£13.80
Bio-Rhythm	Gm	Highlight S/W	6K	C	CC,AB	4.60
Block QC	Gm	Sharpsoft	20K	C	AB	£3.50
Block Stop	Gm	J Wolstencroft	24K	C	CZ	£4.60
Blockade	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Bomber	Gm	Kuma	6K	C	AX,AO,AB	£6.32
Breakout	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Breakout	Gm	Sharpsoft	20K	C	AB	£5.75
Bridge	Gm	Highlight S/W	22K	C	CC	£12.95
Brownian Motion	Ed	Kuma		C	AX	£12.00
CPM	Ut	Chrystal	48K	C	AX,AO	£172.50
Calc II	Bs	Kuma	20K	C	AX,AO,FZ	£39.65
Camelot	Gm	Kuma	48K	C	AX,AC,AB	£6.32
Carols	Gm	Kuma	48K	C	AX,AO,AB	£6.32
Cash Book	Bs	Microtek	48K	C	EQ	£95.00
Casino	Gm	Kuma		C	AX	£6.32
Catch 2000/Invader	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Cesil III	Ed	Kuma	20K	C	AX	£17.20
Chase	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Chess	Gm	Kuma	12K	C	AX,AO,FZ,CH	£12.00
Children's Maths	Ed	Kuma		C	AX	£6.32
Chrystal Basic	Ut	Chrystal	48K	C	AX,AO	£46.00
Colditz	Gm	Sharpsoft	20K	C	CH	£8.46
Combat	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Combat	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Commands	Gm	Sharpsoft	20K	C	AB	£5.85
Composer	Gm	Highlight S/W	6K	C	CC,AB	£5.75
Concentration	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Connect 4	Gm	Highlight S/W	6K	C	CC,AB	£4.60
Cosmiad	Gm	Highlight S/W	10K	C	CC,AB	£5.75
Cosmiad	Gm	Kuma	12K	C	AX,AC,AO,AB	£9.20
Count and Add	Ed	Highlight S/W	22K	C	CC,AB	£5.75
Cribbage	Gm	Kuma	12K	C	AX,AO	£12.00
Cricket	Gm	Kuma		C	AX	£6.32
Cursed Chambers	Gm	J Wolstencroft	48K	C	CZ	£5.75
Data Base	Bs	Kuma	48K	C	AX,AO	£33.95
Data File	Gm	Gamer	48K	C	CZ	£29.95
Disassembler	Ut	Kuma	20K	C	AX,AO,AB	£12.00
Donky Derby	Gm	Kuma	12K	C	AX,AO,AB	£6.32
Double Precision Basic	Ut	Sharp	48K	C	AB	£28.75

Slave Interpreter	Ut	Kuma		C AX	£16.65
Snakes and Ladders	Gm	Kuma	48K	C AX,AO	£6.32
Solid State Non VAT Accounts	Ed	Kuma		C AX	£33.90
Solid State VAT Accounts	Ed	Kuma		C AX	£33.90
Space Battle	Gm	Kuma	48K	C AX,AO,AB	£6.32
Space Invaders	Gm	Kuma	48K	C AX,AO,AC,AB	£6.32
Space Pursuit	Gm	Kuma	48K	C AX,AO,AB	£6.32
Star Trek	Gm	Kuma	10K	C AX,AC,AO	£6.32
Stock Control/Invoicing	Bs	Microtek	48K	C EQ	£316.00
Stomper	Gm	Kuma	10K	C AX,FZ,AB	£6.32
Stomper/Minefields	Gm	Sharpsoft	20K	C AB	£5.85
Submarine	Gm	Kuma	10K	C AX,AO	£6.32
Super Simon	Gm	Kuma	48K	C AX,AO	£6.32
Supercopy	Ut	Kuma	20K	C AX	£12.00
Superfire	Gm	Kuma	48K	C AX	£6.32
Supermouse	Gm	Kuma	48K	C AX,CH	£6.32
Swordmen	Gm	Kuma	48K	C AX,AO	£9.20
Tank Wall	Gm	Kuma	48K	C AX,AO	£6.32
Tenpin Bowling	Gm	Kuma	48K	C AX,AO	£6.32
Timetabling Aid	Ed	Kuma	20K	C AX	£22.45
Towering Inferno	Gm	Sharpsoft	20K	C CH,AB	£5.85
Towers of Hanoi	Gm	Kuma	48K	C AX	£6.32
Track Layer	Gm	Kuma	48K	C AX,CH	£6.32
Trader Smith	Gm	Kuma	48K	C AB	£6.32
Tycoon	Gm	Kuma	48K	C AX,AO	£6.32
UFO	Gm	Kuma	6K	C AX,AC	£6.32
Waves I	Ed	Kuma		C AX	£12.00
Waves II	Ed	Kuma		C AX	£12.00
Wordpro	Bs	Kuma	48K	C AX,AC	£45.45
Wordpro	Bs	Kuma	48K	C AX,AC	£91.95
Zen Dos	Ut	Kuma	4K	C AX	£66.16
Zen Editor Assembler	Ut	Kuma	20K	C AX,AO,AB	£22.45
Zenmod	Ut	Kuma	4K	C AX,AB	£12.00

TRS 80

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
A-Maz-Ing	Gm	Molimerx	4K	C AJ		£6.33
Acquire	Gm	Avalon Hill	16K	C IA		£13.95
Adventure I	Gm	Adventure Int.	16K	C AJ		£13.77
Adventure III	Gm	Adventure Int.	16K	C AJ		£13.77
Adventure III	Gm	Adventure Int.	16K	D AJ		£13.77
Adventures No 1	Gm	Cload Inc	16K	C IA		£11.95
Advanced Programming Aid	Ut	Kansas	16K	C IH		£12.50
Adventureland	Gm	Adventure Int.	24K	D AB		£18.99
Adventure Mysterious	Gm	Adventure Int.	16K	C AJ		£10.06
Adventure Mysterious	Gm	Adventure Int.	32K	D AJ		£13.50
Airflight Simulation	Gm	Instant S/W	16K	C GB,AB		£9.95
Airmail Pilot	Gm	Instant S/W	16K	C GB,AB		£8.50
Ajedut	Bs	Molimerx	32K	C AJ		£49.95
Aladdin	Ed	Bryants S/W	16K	C HW		£3.75
Alien Armada	Gm	Molimerx	16K	C AJ		£10.06
Alien Armada	Gm	Molimerx	32K	D AJ		£13.23
Alien Attack Force	Gm	Instant S/W	16K	C GB,AB		£8.50
Alien Attack	Gm	Kansas	16K	C IH		£9.50
Alien Defence	Gm	Soft Sector Mktng	16K	C IA		£11.95
Alien Defence	Gm	Soft Sector Mktng	16K	D IA		£11.95
All Stars	Gm	Instant S/W	16K	D GB		£26.50
All Turret Gunner	Gm	Instant S/W	16K	C GB,AB		£8.50
Amateur Log	Ut	Molimerx	32K	D AJ		£18.40
Amazing Maze						
Touchdown	Gm	Kansas	16K	C IH		£7.50
Angel Worms	Gm	Adventure Int.	8K	C AB		£14.35
Animation	Ut	Molimerx	16K	C AJ		£17.20
Animation	Ut	Molimerx	32K	D AJ		£20.65
Android Nim	Gm	Molimerx	16K	C AJ		£10.06
Arcade Invaders	Gm	Kansas	16K	C IH		£9.50
Arcade Scramble	Gm	Kansas	16K	C IH		£9.50
Armoured Patrol	Gm	Adventure Int.	16K	C GB		£15.50
Armoured Patrol	Gm	Adventure Int.	16K	D AB		£18.99
Ascertain	Ut	Kansas	16K	C IH		£6.25
Assembly Package	Ut	Molimerx	32K	D AJ		£74.75
Asteroids	Gm	Molimerx	16K	C AJ		£10.06
Asteroids	Gm	Molimerx	32K	D AJ		£13.50
Astro Navigator	Gm	Molimerx	16K	C AJ		£14.95
Astrobball	Gm	Molimerx	16K	C AJ		£13.77
Astrolog	Ed	Molimerx	16K	C AJ		£10.93
Astronomical Calendar	Ed	Molimerx	16K	C AJ		£10.93
Asylum	Gm	Med Systems		C IA		£12.00
Atlantian Odyssey	Gm	Guild		C GB		£19.75
Atlantian Odyssey	Gm	Guild		D GB		£21.50
Attack Force	Gm	Big 5 S/W	16K	C IA		£10.95
BI Nuclear Bomber	Gm	Instant S/W	16K	C GB		£12.50
BQ81	Bs	Baust Computing	48K	D HA		£79.95
Back 40	Gm	Molimerx	16K	C AJ		£10.06
Back 40	Gm	Molimerx	32K	D AJ		£13.50
Back 40 III	Gm	Adventure Int.	16K	C AB		£14.35
Backgammon	Gm	Adventure Int.	16K	C AB		£7.99
Backgammon	Gm	Kansas	16K	C IH		£8.50
Balrog Sampler	Gm	Adventure Int.	16K	D AB		£33.70
Bandito	Gm	Acorn	16K	C AJ		£7.49

Bandit/Maze Chase	Gm	Kansas	16K	C IH		£7.50
Banner	Ut	Kansas	16K	C IH		£7.50
Basic Bidding	Gm	Bryants S/W	16K	C HW		£9.00
Basic Compiler Accel.	Ut	Microsoft	16K	C AJ		£22.94
Basic Compiler Accel. 3	Ut	Microsoft	16K	C AJ		£45.95
Basic Compiler Accel. 3	Ut	Microsoft	16K	D AJ		£49.95
Basic Insert	Ut	Molimerx	16K	C AJ		£10.95
Basic Insert	Ut	Molimerx	32K	D AJ		£14.39
Basic Programming System	Ut	Instant S/W	16K	C AB		£12.50
Basketball	Gm	Molimerx	16K	C AJ		£10.95
Basketball	Gm	Molimerx	32K	D AJ		£14.39
Battle of Britain	Gm	Molimerx	16K	C AJ		£15.55
Battle Ground	Gm	Instant S/W	16K	C GB,AB		£8.50
Bearings	Ed	Bryants S/W	16K	C HW		£3.75
Bedchest III	Gm	Adventure Int.	16K	C AB		£20.95
Beewary	Gm	Molimerx	16K	C AJ		£10.06
Beginner's Russian	Ed	Instant S/W	16K	C GB,AB		£8.50
Biorhythm	Ed	Molimerx	16K	C AJ		£8.63
Biorhythms	Do	Kansas	16K	C IH		£7.50
B-I Nuclear Bomber	Gm	Avalon Hill	16K	C IA		£11.95
Blackboard	Ut	Molimerx	16K	C AJ		£10.06
Blackjack Master	Gm	Molimerx	16K	C AJ		£21.15
Blackjack Master	Gm	Molimerx	32K	D AJ		£25.42
Blink 1	Ut	Molimerx	32K	D AJ		£17.00
Blockade	Gm	Molimerx	16K	C AJ		£7.48
Bradley Estate Mystery	Gm	Ogre	16K	C IC		£10.00
Bright & Early	Ed	Molimerx	16K	C AJ		£8.90
Build High						
Knights Tour	Gm	Kansas	16K	C IH		£7.50
Business Analysis	Bs	Instant S/W	16K	C GB		£59.25
Business Analysis	Bs	Instant S/W	16K	D GB,AB		£82.00
Buzzword	Ed	Molimerx	16K	C AJ		£5.75
Byte Saver	Ut	Kansas	16K	C IH		£6.25
CTN Stock	Bs	Baust Computing	48K	D HA		£79.00
Calendar	Ut	Molimerx	16K	C AJ		£10.29
Car Doctor	Do	Kansas	16K	C IH		£7.50
Cash Register	Bs	Molimerx	16K	C AJ		£10.29
Catalogue	Do	Bryants S/W	16K	C HW		£3.75
Character and Monster Generator	Gm	Ogre	16K	C IC		£12.00
Checker King	Gm	Personal S/W	16K	C AJ		£16.10
Chemical Formulae	Ed	Molimerx	16K	C AJ		£10.95
Cheque Book	Dm	Molimerx	16K	C AJ		£15.53
Claws	Ed	Bryants S/W	16K	C HW		£3.75
City Encounters	Ut	Molimerx	16K	C AJ		£17.20
Climate Comp	Bs	Instant S/W	16K	C AB		£20.50
Cload Cassette	Gm	Cload Inc	16K	C IA		£5.75
Code Breaker	Gm	Molimerx	16K	C AJ		£7.49
Combat	Gm	Adventure Int.	16K	C AB		£12.50
Company Director	Gm	Molimerx	16K	C AJ		£17.19
Compression Utility	Ut	Instant S/W	16K	C GB		£15.75
Comproc	Ut	Molimerx	16K	C AJ		£15.80
Comput-A-Organ	Ed	Molimerx	16K	C GB		£6.85
Computer Acquire	Gm	Adventure Int.	16K	C IA		£10.15
Computer Acquire	Gm	Avalon Hill	16K	C IA		£17.25
Computer Pools	Do	Molimerx	16K	C AJ		£16.68
Conflict 2500	Gm	Avalon Hill	16K	C IA		£12.95
Conquest of Chester Wood	Gm	Adventure Int.	16K	C AB		£18.99
Constellation	Ed	Molimerx	16K	C AJ		£14.30
Constellation	Ed	Molimerx	32K	D AJ		£17.83
Conv/CPM	Ut	Molimerx	32K	D AJ		£20.70
Convoy Raider	Gm	Avalon Hill		C IA		£10.95
Cop 16K	Ut	Molimerx	16K	C AJ		£12.95
Copsys	Ut	Molimerx	16K	C AJ		£12.95
Copran	Gm	Molimerx	16K	C AJ		£32.79
Cosmic Fighter	Gm	Big 5 S/W		C IA		£10.95
Cosmic Patrol	Gm	Instant S/W	16K	C GB,AB		£12.50
Cosmic Patrol	Gm	Instant S/W	16K	D GB,AB		£16.25
Cowboys	Gm	P.C.S.	8K	C IE		£4.25
Creole Lobster Catcher	Gm	Molimerx	16K	C AJ		£10.06
Cribbage	Gm	Molimerx	16K	C AJ		£14.38
Crocodiles	Ed	Bryants S/W	16K	C HW		£3.75
Cross Reference	Bs	Molimerx	16K	C AJ		£8.45
Crown of CWL IMDRAS part 1						
Crown of CWL IMDRAS part 2	Gm	Ogre	16K	C IC		£10.00
Cube Hunt	Gm	Ogre	16K	C IC		£10.00
Curse of Crawley Manor	Gm	Molimerx	16K	C AJ		£10.35
DLDIS	Gm	Adventure Int.	16K	D AB		£18.99
DLDIS	Ut	Instant S/W	16K	D GB		£15.50
DSM						
Danger in Orbit	Ut	Racet Computers	32K	D AJ		£46.00
Danger in Orbit	Gm	Instant S/W	16K	C AB		£12.50
Daredevil	Gm	Instant S/W	16K	D GB		£15.50
Dark Void	Gm	Instant S/W	16K	C IA		£8.50
Darts	Gm	Molimerx	16K	C AJ		£10.06
Data Base Management	Gm	Molimerx	16K	C AJ		£10.06
Data Base Management	Bs	Hubert Howe	32K	C AJ		£28.75
Datadisk	Bs	Hubert Howe	32K	D AJ		£32.20
Data File	Bs	Kansas	32K	D IH		£24.50
Datestone of Ryn	Bs	Kansas	16K	C IH		£9.50
Datestone of Ryn	Gm	Automated Simulation	16K	C GB		£13.50
Datestone of Ryn	Gm	Automated Simulation	16K	C GB		£13.50
Dataquiz	Ut	Bryants S/W	16K	C HW		£3.75
Day of the Week	Bs	Molimerx	4K	C AJ		£5.75
Deathmaze 5000	Gm	Med Systems	16K	C IA		£10.95
Decision Master	Ut	Sytnic S/W	32K	D GB		£35.50

REFERENCE

SOFTWARE LISTING

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier	Codes & Price
Decimal Dan	Ed	Bryants S/W	16K	C	HW	£3.75
Defence Command	Gm	Big 5 S/W		C	IA	£10.95
Defend	Gm	Molimerx	16K	C	AJ,CH	£14.95
Defend	Gm	Molimerx	32K	D	AJ	£18.40
Deflections	Gm	Adventure Int.	8K	C	AB	£14.35
Delay	Ut	Kansas	16K	C	IH	£6.25
Demo II	Gm	Instant S/W	16K	C	IE	£6.50
Descriptive Statistics	Bs	Molimerx	16K	C	AJ	£15.40
Differential Equations	Bs	Molimerx	16K	C	AJ	£16.10
Direction Finder	Ed	Molimerx	16K	C	AJ	£15.40
Disassembler	Ut	Molimerx	16K	C	AJ	£10.35
Disassembler	Ut	Buy Byte	16K	C	GB	£8.25
					AB	£8.50
Disassembler	Ut	Kansas	16K	C	IH	£8.50
Disc Directory	Ut	Molimerx	32K	D	AJ	£20.13
Disc Editor	Ut	Instant S/W	16K	D	GB	£30.50
Disc Scope	Ut	Instant S/W	16K	D	GB	£15.50
Discaid	Ut	Molimerx	32K	D	AJ	£19.49
Discator	Ut	Molimerx	32K	D	AJ	£29.90
Dnieper River Line	Gm	Avalon Hill	32K	C	IA	£12.95
Dnieper River Line	Gm	Avalon Hill	32K	D	IA	£17.55
Doctor Chips	Gm	Instant S/W	16K	C	GB	£12.50
Doctor Chips	Gm	Instant S/W	16K	D	GB	£14.75
Dominoes	Gm	Molimerx	16K	C	AJ	£9.15
Dominoes	Gm	Molimerx	32K	D	AJ	£12.65
Doomwatch	Do	Kansas	16K	C	IH	£7.50
Dosort	Ut	Molimerx	32K	C	AJ	£27.60
Double Take 3741	Ut	Molimerx	64K	D	AJ	£44.85
Double Up	Ut	Kansas	16K	C	IH	£6.25
Dragon Quest	Gm	Instant S/W	16K	C	GB	£13.25
Dragon Quest	Gm	Instant S/W	16K	D	GB	£17.50
Dragons of Hong Kong	Gm	Adventure Int.	32K	C	AB	£18.99
Draughts	Gm	Molimerx	16K	C	AJ	£14.95
Draughts	Gm	Molimerx	32K	D	AJ	£18.40
Draw and Graphics Resolver	Bs	Molimerx	16K	C	AJ	£10.95
Dreamworld	Gm	Molimerx	16K	C	AJ	£10.06
Driver	Gm	Molimerx	4K	C	AJ	£6.33
Duel-n-Droids	Gm	Molimerx	16K	C	AJ	£10.93
Dungeon Escape	Gm	Computer Shack	16K	C	GB	£11.95
Dungeon Escape	Gm	Computer Shack	16K	D	GB	£15.50
Dynamic Device Driving	Ut	Instant S/W	16K	D	GB	£20.50
Dynamic Device Driving	Ut	Instant S/W	16K	C	GB	£15.50
					AB	£16.50
Early Numbers	Ed	Bryants S/W	16K	C	HW	£3.75
Edas	Ut	Molimerx	32K	D	AJ	£53.49
Edit	Ut	Molimerx	16K	C	AJ	£20.13
Editor Assembler Plus	Ut	Molimerx	16K	C	AJ	£24.95
Editor Assembler and Debugger	Ut	Kansas	16K	C	IH	£19.50
Edjust	Ut	Molimerx	32K	D	AJ	£18.40
Eights	Gm	Emjay	16K	C	IG	£7.00
Electric Accountant	Bs	Molimerx	48K	D	AJ	£28.75
Electronic Breadboard	Ut	Instant S/W	16K	C	GB	£39.75
					AB	£40.95
Elemental Maze	Ed	Molimerx	16K	C	AJ	£10.93
Eliminator	Gm	Adventure Int.	16K	C	GB	£15.50
Eliminator	Gm	Adventure Int.	16K	D	AB	£18.99
Emperor	Gm	Molimerx	16K	C	AJ	£15.53
Empire of the Overmind	Gm	Avalon Hill	48K	C	IA	£17.95
Enhanced Basic	Ut	Molimerx	16K	C	AJ	£27.60
Enhanced Basic	Ut	Molimerx	32K	D	AJ	£31.05
Epson Patch	Ut	Molimerx	16K	C	AJ	£13.80
Epson Patch	Ut	Molimerx	32K	D	AJ	£17.25
Escape from Tramm	Gm	Adventure Int.	16K	D	AB	£18.99
Everest Explorer	Gm	Molimerx	16K	C	AJ	£10.06
Escape	Gm	Kansas	16K	C	IH	£7.50
Everest Explorer	Gm	Molimerx	32K	D	AJ	£13.50
Everyday Russian	Ed	Instant S/W	16K	C	GB,AB	£8.50
F for Freddie	Gm	Kansas	16K	C	IH	£9.50
Facto Bingo	Ed	Bryants S/W	16K	C	HW	£3.75
Facto Finder	Ed	Bryants S/W	16K	C	HW	£3.75
Fairytale Adventure	Gm	Molimerx	16K	C	AJ	£10.06
Family Tree	Do	Molimerx	32K	D	AJ	£20.70
Farmer Brown	Gm	Molimerx	16K	C	AJ	£7.49
Fed	Ut	Molimerx	32K	D	AJ	£27.60
Fetch	Ut	Molimerx	32K	D	AJ	£15.53
File Handling for Cassette	Ut	Molimerx	16K	C	AJ	£15.93
File Handling for Disc	Ut	Molimerx	32K	D	AJ	£28.75
Filter Package	Ut	Molimerx	32K	D	AJ	£40.25
Financial Analysis	Bs	Molimerx	32K	D	AJ	£46.00
Find it Quick	Ut	Instant S/W	16K	D	GB	£39.75
					AB	£40.95
Flight Path	Gm	Instant S/W	16K	C	GB,AB	£8.50
Flight Plan	Ut	Molimerx	32K	D	AJ	£20.70
Flying Circus	Gm	Instant S/W	16K	D	AB	£24.50
					GB	£25.00
Forbidden City	Gm	Fantastic S/W	16K	D	IA	£24.95
Forbidden Planet	Gm	Fantastic S/W	48K	D	IA	£24.95
Forest of Mordor	Gm	Molimerx	16K	C	AJ	£8.63
Fortran	Ut	Molimerx	32K	D	AJ	£74.75
Fortress	Gm	Soft Sector Mktng	16K	D	IA	£15.50
Fortress	Gm	Soft Sector Mktng	16K	C	IA	£11.95
Fox and Hounds	Gm	Molimerx	16K	C	AJ	£7.48
French Vocabulary	Ed	Molimerx	16K	C	AJ	£17.19
Frog	Gm	Adventure Int.	16K	C	AB	£12.50
Frog	Gm	Molimerx	16K	C	AJ	£7.48
Frogs/Logic	Gm	Kansas	16K	C	IH	£7.50
Galactic Empire	Gm	Adventure Int.	16K	C	AJ,AB	£9.78
Galactic Empire	Gm	Adventure Int.	32K	D	AB	£18.99
Galactic Firebird	Gm	Kansas	16K	C	IH	£9.50
Galactic Revolution	Gm	Adventure Int.	16K	C	AB	£18.99
Galactic Revolution	Gm	Adventure Int.	16K	C	AJ	£9.78
Galactic Trader	Gm	Adventure Int.	16K	C	AJ	£9.78
Galactic Trader	Gm	Adventure Int.	32K	D	AB	£18.99
Galaxy Invasion	Gm	Big 5 S/W	16K	C	IA	£10.95
Gammon Challenger	Gm	Molimerx	16K	C	AJ	£10.06
Gammon Challenger	Gm	Molimerx	32K	D	AJ	£13.51
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
Gauntlet of Death	Gm	Programmer's Guild	16K	C	GB	£15.50
G.C.E. O'Levels						
Tape 1	Ed	Bryants S/W	16K	C	HW	£9.00
Tape 2	Ed	Bryants S/W	16K	C	HW	£9.00
Gencop	Ut	Molimerx	16K	C	AJ	£10.06
Geography Explorer	Ed	Instant S/W	16K		AB	£40.95
Ghost Town	Gm	Adventure Int.	24K	D	AB	£18.99
Golden Voyage	Gm	Adventure Int.	24K	D	AB	£18.99
Golf	Gm	Molimerx	32K	D	AJ	£17.19
Good Games No.1	Gm	Cload Inc	16K	C	IA	£11.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	C	IA	£12.95
Guns of Fort Defiance	Gm	Avalon Hill	32K	D	IA	£14.95
Gun World	Gm	Ogre	16K	C	IC	£10.00
Graphics Assembler	Ut	Kansas	16K	C	IH	£7.50
Graphs	Ed	Bryants S/W	16K	C	HW	£3.75
Gridref	Ed	Bryants S/W	16K	C	HW	£3.75
Highway Code	Do	Bryants S/W	16K	C	HW	£3.75
HMS Impetuous	Gm	Adventure Int.	32K	D	AB	£18.99
Home Budget Planner	Bs	Emjay	16K	C	IG	£8.00
House of 30 Gables	Gm	Instant S/W	16K	C	AB	£8.50
Hyperlight Patrol	Gm	Fantastic S/W	16K	D	GB	£11.25
ID Mailing List	Ut	Instant S/W	16K	D	GB	£19.50
					AB	£20.50
IRV	Ut	Instant S/W	16K	D	GB	£23.75
IRV	Ut	Instant S/W	16K	C	GB	£19.50
					AB	£20.50
Infinite Startrek	Gm	Kansas	16K	C	IH	£9.50
Invoicing	Bs	Tridata	48K	D		£140.00
Interlude	Gm	Syntonic S/W		C	GB	£20.25
Interlude	Gm	Syntonic S/W		D	GB	£23.50
Invasion Orion	Gm	Automated		C	GB	£13.25
Invasion Orion	Gm	Simulation				
		Automated				
		Simulation		D	GB	£15.75
Investor's Paradise	Gm	Instant S/W	16K	C	AB	£8.50
Jabbertalky	Gm	Automated				
		Simulation	16K	D	GB	£18.95
Jet Fighter Pilot	Gm	Instant S/W	16K	C	GB,AD	£12.50
Jumbles	Ed	Bryants S/W	16K	C	HW	£3.75
Keyspeed	Ut	Kansas	16K	C	IH	£6.25
Kid's Gallery	Gm	Instant S/W	16K	C	AB	£8.50
Label	Gm	Instant S/W	16K	C	GB	£18.75
					AB	£20.50
Labyrinth	Gm	Med Systems	16K	C	IA	£11.75
					BT	£10.95
Laser Defence	Gm	Med Systems	16K	C	GB	£11.95
Laser Defence	Gm	Med Systems	16K	D	GB	£14.50
Little Red Riding Hood	Gm	Adventure Int.	16K	C	AB	£14.35
Local Call for Death	Gm	Adventure Int.	32K	D	AB	£18.99
Lords of Karma	Gm	Avalon Hill	40K	D	IA	£14.95
Lord of the Rings	Gm	Kansas	16K	C	IH	£9.50
Lunar Lander	Gm	Adventure Int.	16K	C	AB	£12.50
Lunar Lander	Gm	Adventure Int.	16K	D	AB	£18.99
Lprint	Ut	Kansas	16K	C	IH	£6.25
Mail File	Ut	Instant S/W		D	GB	£75.25
Martian Adventure	Gm	Emjay	16K	C	IG	£12.00
Master Cab	Ut	Bryants S/W	16K	C	HW	£3.75
Master Directory	Ut	Instant S/W	16K	D	GB	£21.00
Master Reversi	Ut	Instant S/W	16K	D	GB	£23.75
Matchmaker	Gm	Adventure Int.	16K	C	AB	£14.35
Maths Master	Ed	Instant S/W	16K	C	AB	£8.50
Maxi-Micro Manager	Bs	Adventure Int	48K	R	AB	£84.50
Merge	Ut	Kansas	16K	C	IH	£6.25
Meteor Mission	Gm	Big 5 S/W	16K	C	IA	£10.95
Microcosm 1	Gm	Basic & Beyond	16K	C	IA	£11.95
Microcosm 2	Gm	Basics & Beyond	16K	C	IA	£19.95
Microcosm 3	Gm	Basics & Beyond	16K	C	IA	£19.50
Microtype	Do	Kansas	16K	C	IH	£12.50
Midway Campaign	Gm	Avalon Hill	16K	C	IA	£10.95
Minotaur	Gm	Instant S/W	16K	C	AB	£8.50
Missile Attack	Gm	Adventure Int.	16K	C	AB	£12.50
Mission Impossible	Gm	Adventure Int.	24K	D	AB	£18.99
Model 1 to 3	Ut	Kansas	16K	C	IH	£8.50
Monopolist	Gm	Baust Computing	4K	C	HA	£7.95
Monopolist	Gm	Baust Computing	4K	D	HA	£10.95
Mountain Shoot	Gm	Adventure Int.	16K	D	AB	£18.99
Multiple Choice Creation	Ed	Kansas	16K	C	IH	£12.50
Multiprint	Ut	Kansas	16K	C	IH	£8.50
Music Master	Gm	Instant S/W		C	GB,AB	£8.50
Musical Yat-C	Gm	Adventure Int.	16K	C	AB	£12.50
Money Box	Ed	Bryants S/W	16K	C	HW	£3.75

Mystery Funhouse	Gm	Adventure Int.	24K	D AB	£18.99
News 80	Bs	Baust Computing	48K	D HA	POA
Night Flight	Gm	Instant S/W	16K	C GB,AB	£8.50
Nominal	Bs	Tridata	48K	D ID	£170.00
Norton FORTH	Gm	Adventure Int.	32K	D AB	£33.70
North Atlantic Raiders	Gm	Tridata	16K	C IA	£11.95
Number Bonds	Ed	Bryants S/W	16K	C HW	£3.75
Nuke War	Gm	Avalon Hill	16K	C IA	£10.95
Oil Tycoon	Gm	Instant S/W	16K	C AB	£8.50
				GB	£9.95
Old McDonald's Farm	Gm	Adventure Int.	16K	C AB	£14.35
On Guard	Ed	Bryants S/W	16K	C HW	£3.75
Patience	Gm	Bryants S/W	16K	C HW	£3.75
Payroll	Bs	Tridata	48K	D ID	£170.00
Perfect Pong	Gm	Instant S/W	16K	C GB,AB	£12.75
Personal Bill Paying	Do	Instant S/W	16K	C AB	£6.50
Personal Accounts	Do	Kansas	16K	C IH	£9.50
Pinball Bounce/Robots	Gm	Kansas	16K	C IH	£7.50
Pirate Adventure	Gm	Adventure Int.	24K	D AB	£18.99
Pits of Angband	Gm	Kansas	16K	C IH	£9.50
Planet Miners	Gm	Avalon Hill	16K	C IA	£10.95
Planetoids	Gm	Adventure Int.	16K	C AB	£12.50
Plus Sound	Ut	Kansas	16K	C IH	£7.50
Programmer and Primer	Ut	Instant S/W	16K	C AB	£8.50
Programmer's Converter	Ut	Instant S/W	16K	C AB	£8.50
Pontoon	Gm	Kansas	16K	C IH	£8.50
Punctuation	Ed	Bryants S/W	16K	C HW	£3.75
Purchase	Bs	Tridata	48K	D ID	£170.00
Pyramids of Doom	Gm	Adventure Int.	24K	D AB	£18.99
QSL Manager	Do	Instant S/W	16K	AB	£16.50
Quick Change	Bs	Baust Computing	16K	C HA	£9.95
Quick Change	Bs	Baust Computing	16K	D HA	£12.95
Random Dungeons	Gm	Ogre	16K	C IC	£10.00
Random Dungeons	Gm	Ogre	4K	C IC	£5.75
Re-number and Compress	Ut	Instant S/W	16K	C AB	£8.50
Re-Number	Ut	Kansas	16K	C IH	£6.25
Repeat	Ut	Kansas	16K	C IH	£6.25
Rescue	Ut	Kansas	16K	C IH	£6.25
Robot Attack	Gm	Big 5	16K	C IA	£10.95
SDM	Gm	Adventure Int.	16K	C AB	£20.12
Sales	Bs	Tridata	48K	D ID	£170.00
Santaparavia	Gm	Instant S/W	16K	C AB	£8.50
Savage Island I	Gm	Adventure Int.	24K	D AB	£18.99
Savage Island II	Gm	Adventure Int.	24K	D AB	£18.99
Scrafman	Gm	Cornsoft	48K	C IA	£11.95
Screen Print	Ut	Kansas	16K	C IH	£6.25
Sea Wolf	Gm	Kansas	16K	C IH	£9.50
Showdown	Gm	Adventure Int.	16K	C AB	£12.50
Silverflash	Gm	Adventure Int.	16K	C AB	£12.50
Simutec	Gm	Adventure Int.	16K	C AB	£12.50
Six Microstories	Gm	Adventure Int.	32K	D AB	£14.35
Skirmish 80	Gm	Instant S/W	16K	C IA	£8.50
Sky Warrior	Gm	Adventure Int.	16K	D AB	£18.99
Slag	Gm	Adventure Int.	16K	C AB	£14.35
Smartwork	Gm	Instant S/W	16K	C IA	£8.00
Space Castle	Gm	Instant S/W	16K	C IA	£11.95
Space Intruder	Gm	Adventure Int.	16K	C AB	£14.35
Space Shuttle	Gm	Instant S/W	16K	C AB	£12.50
Star Fighter	Gm	Adventure Int.	16K	C AB	£20.95
Star Scout	Gm	Adventure Int.	16K	C AB	£14.35
Star Trek 3.5	Gm	Adventure Int.	32K	D AB	£18.99
Space Trek	Gm	Instant S/W	16K	C IA	£6.50
Speechparts	Ed	Bryants S/W	16K	C HW	£3.75
Spellsort	Ed	Bryants S/W	16K	C HW	£3.75
Spelltest	Ed	Bryants S/W	16K	C HW	£3.75
Starlord	Gm	Bryants S/W	16K	C IC	£10.00
Storybuilder	Ed	Bryants S/W	16K	C HW	£3.75
Stock	Bs	Tridata	48K	D ID	£170.00
Stock or Bonds	Gm	Avalon Hill	16K	C IA	£12.95
Stone of Sisythus	Gm	Adventure Int.	32K	D AB	£33.70
Strange Odyssey	Gm	Adventure Int.	24K	D AB	£18.99
Sunday Golf	Gm	Adventure Int.	16K	D AB	£18.99
Surveyor's Apprentice	Ed	Instant S/W	16K	C AB	£8.50
Super Breakthrough	Gm	Kansas	16K	C IH	£8.50
Super Copy	Ut	Kansas	16K	C IH	£9.50
Super Nova	Gm	Big 5	16K	C IH	£10.95
Swamp War	Gm	Instant S/W	16K	C AB	£12.50
Swords and Socracy	Gm	Kansas	16K	C IH	£9.50
System Master Monitor	Ut	Kansas	16K	C IH	£17.00
System to Basic	Ut	Kansas	16K	C IH	£8.50
TL DIS	Ut	Instant S/W	16K	C AB	£12.50
TRS Test	Ut	Instant S/W	16K	C AB	£8.50
Tables Test	Ed	Bryants S/W	16K	C HW	£3.75
Tanktics	Gm	Avalon Hill	16K	C IA	£15.95
Targetsounds	Ed	Bryants S/W	16K	C HW	£3.75
Teacher's Aid	Ed	Instant S/W	16K	AB	£34.50
Temple of the Sun	Gm	Instant S/W	16K	AB	£16.50
The Count	Gm	Adventure Int.	24K	D AB	£18.99
The Mean Checkers Machine	Gm	Adventure Int.	16K	C AB	£14.35
The Congo Mission	Gm	Bryants S/W	16K	C IC	£10.00
The Quest	Gm	Bryants S/W	16K	C IC	£12.00
The Secret Wilderness	Gm	Ogre	16K	C IC	£6.50
Toolkit	Ut	Kansas	16K	C IC	£12.00
Towers	Ed	Bryants S/W	16K	C HW	£3.75
Treasure Quest	Gm	Adventure Int.	16K	C AB	£14.35
Tunnels of Fahad	Gm	Adventure Int.	16K	C AB	£12.50
Two Heads of the Coin	Gm	Adventure Int.	32K	D AB	£18.99
Typing Teacher	Ed	Instant S/W	16K	C AB	£8.50
Typewriter	Ut	Kansas	16K	C IH	£6.25
Ultra Man	Ut	Instant S/W	16K	AB	£21.50

Utility II	Ut	Instant S/W	16K	C IA	£8.50
Valley	Gm	CT Software	16K	C PF	£9.95
Valley of the Kings	Gm	Instant S/W	16K	C IC	£10.00
Venture	Gm	Horizon S/W	16K	C IA	£11.95
Voodoo Castle	Gm	Adventure Int.	24K	D AB	£18.99
Voyager	Gm	Avalon Hill	16K	C IA	£12.95
What Next?	Gm	Baust Computing	4K	D HA	£6.95
What Next?	Gm	Baust Computing	4K	C HA	£3.95
Word Processor	Bs	Kansas	16K	C IH	£19.50
Word Watch	Ed	Instant S/W	16K	C IA	£6.50
Yahtzee	Gm	Kansas	16K	C IH	£8.50
Your Life Score	Do	Bryants S/W	16K	C HW	£3.75
Zossed in Space	Gm	Adventure Int.	16K	D AB	£14.35
Zossed in Space	Gm	Adventure Int.	16K	C CH	£10.00

VIC20

Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
3-D Maze	Gm	Adcom	8K	C AB		£7.50
3-D Maze	Gm	Hi-Tech	3K	C FZ		£8.30
					CF,AO	£8.62
A-Maz-Ing	Gm	Audiogenic	8K	C AA,CH,HM		£6.99
Alien	Gm	Commodore	3K	R FZ,AB,GF		
					CF,DM,CH	
					FD,FP,AA	£19.95
Alien Attack	Gm	Adcom	5K	C AB		£7.00
Alien Attack	Gm	Hi-Tech	3K	C CF,AO		£8.62
Alien Blaster	Gm	Paysoft	5K	C FP		£5.25
Alien Blitz	Gm	Audiogenic	3K	C AA,HM		£7.99
Alien Blitz	Gm	Audiogenic	5K	C CH		£7.99
Alien Maze	Gm	Adcom	8K	C AB		£7.50
Alien Maze	Gm	Hi-Tech	3K	C FZ		£8.30
					CF,AO	£8.62
Alien Wars	Gm	Hi-Tech	3K	C FZ		£8.30
					AY	£7.80
					CF,AO	£8.62
Amok	Gm	Audiogenic	5K	C AA,HM		£6.99
Ant Raiders	Gm	PR Software	3K	C HN		£7.95
Asteroid Belt	Gm	Adcom	8K	C AB		£7.50
Asteroid Belt	Gm	Hi-Tech	3K	C CF,AO		£8.62
Asteroids	Gm	Bug Byte	5K	C HN		£8.99
Avenger	Gm	Commodore	3K	R FZ,AB,GF		
					CF,DM,CH	
					FD,FP,AA	£19.95
A.V.I.T.W.	Gm	Bug Byte	5K	C HN		£8.99
Balloon Bomber	Gm	Hi-Tech	3K	C CF,AO		£8.62
Blitz	Gm	Commodore	3K	C FD		£4.99
Car Drive	Gm	Adcom	5K	C AB		£7.00
Car Drive	Gm	Hi-Tech	3K	C FZ		£8.30
					AY	£7.80
					CF	£8.62
Car Race	Gm	Adcom	5K	C AB		£7.00
Car Race	Gm	Hi-Tech	3K	C CF,AO		£8.62
Charset 20	Gm	Adcom	8K	C AB		£8.00
Charset 20	Gm	Rabbit S/W	3K	C AH		£4.99
Chess	Gm	Commodore	3K	R HN		£24.95
Cloudburst	Gm	Audiogenic	3K	R HN		£19.99
Code Breaker	Gm	Adcom	5K	C AB		£5.00
Code Breaker	Gm	Rabbit S/W	3K	C AH		£2.99
Cosmic Battle	Gm	Adcom	5K	C AB		£8.00
Cosmic Battle	Gm	Rabbit S/W	3K	C AH		£4.99
Crazy Balloon	Gm	Hi-Tech	3K	C CF,AO		£8.62
Defenda	Gm	Llamasoft	5K	C HN		£9.95
Deflection	Gm	Adcom	5K	C AB		£7.00
Deflection	Gm	Hi-Tech	3K	C CF,AO		£8.62
Dragon Maze	Gm	Adcom	8K	C AB		£7.50
Dragon Maze	Gm	Hi-Tech	3K	C FZ		£8.30
					CF,AO	£8.62



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Title	Program Type	Program Produced By	Memory Req'd	How Sold	Supplier Codes	Prices
Dune Buggy	Gm	Rabbit S/W	3K	C	AH	£4.99
Duplicate	Gm	Paysoft	5K	C	FP	£5.25
Fire Trek	Gm	Hi-Tech	3K	C	AY	£7.80
					FZ	£8.30
					CF, AO	£8.62
Fly Snatcher	Gm	PR Software	3K	C	HN	£7.95
Frogger	Gm	Rabbit S/W	8K	C	AH	£7.99
Game Graphics & Graphics Editor	Ut	Soft Toys	3K	C	IG	£8.00
Games Tape I	Gm	Titan	3K	C	HJ	£5.00
Grand Prix	Gm	Hi-Tech	3K	C	FZ, 8.30	
					AY	£7.80
Gun Men	Gm	Hi-Tech	3K	C	AY	£7.80
					FZ	£8.30
					CF, AO	£8.62
Hangman	Gm	Paysoft	5K	C	FP	£5.25
Hangman Maths	Gm	Audiogenic		C	AA, HM	£7.99
Hesdon	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Highways Plot	Gm	Adcom	8K	C	AB	£5.00
ICBM	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Invader Fall	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF, AO	£8.62
Indi 500	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Intro. to Basic I	Ed	Commodore	3K	C	AA, AB	£14.95
Invader Fall	Gm	Adcom	8K	C	AB	£7.50
Invader Fall	Gm	Audiogenic	3K	C	AA	£6.99
Jelly Monsters	Gm	Commodore	3K	R	AB, CF, DM	
					GC, GF, AA	£19.95
					CH	
Jungle	Gm	Adcom	5K	C	AB	£6.00
Jungle	Gm	Rabbit S/W	3K	C	AH	£4.99
Kiddy Checkers	Gm	Audiogenic	3K	C	AA, HM	£6.99
Lunar Lander	Gm	Adcom	5K	C	AB	£7.00
Lunar Lander	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Lunar Maths	Ed	Titan	3K	C	HJ	£6.00
Machine Code Monitor	Ut	Commodore	3K	R	AA, AB	£34.95
Machine Code Monitor	Ut	Commodore	3K	R	GF	POA
Master Wits	Gm	Audiogenic	3K	C	AA, HM	£6.99
Maths Hurdler/Monster Merge	Gm	Audiogenic		C	AA, HM	£7.99
Maze Men	Gm	Titan	3K	C	HJ	£6.00
Memory Pack	Ut	Commodore	16K	R	FZ	£74.95
Memory Pack	Ut	Commodore	3K	R	FZ	£24.95
Memory Pack	Ut	Commodore	8K	R	FZ	£44.95
Meteor Run	Gm	Anglo American	3K	R	HN	£24.99
Meteoroid	Gm	Adcom	5K	C	AB	£10.00
Missile Command	Gm	Adcom	3K	C	HN	£7.95
Missile Commander	Gm	Hi-Tech	3K	C	CF	£8.62
Moak	Gm	Audiogenic	5K	C	CH	£6.99
Mole Attack	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Music Maker	Gm	Adcom	5K	C	AB	£10.00
Naval Attack	Gm	Titan	3K	C	HJ	£7.00
Naval Battle	Gm	Hi-Tech	3K	C	CF, AO, FZ	£8.62
New York	Gm	Paysoft	5K	C	FP	£5.25
Night Flight	Gm	Rabbit S/W	3K	C	AH	£4.99
Othello	Gm	Hi-Tech	3K	C	FZ	£8.30
					CF	£8.62
					AO, AY	£7.80
Pack Man	Gm	Hi-Tech	3K	C	FZ	£8.30
					AO	£8.62
					AY	£7.80
Programmer's Aid	Ut	Commodore	3K	R	AA, AB	£34.95
Rabbit Functions	Ut	Rabbit S/W	3K	C	AH	£4.99
Rabbit Writer	Ut	Rabbit S/W	16K	C	AH	£9.99
Rat Race	Gm	Commodore	3K	R	HN	£19.95
Renaissance	Gm	Audiogenic	3K	R	HN	£19.99
Road Race	Gm	Commodore	3K	R	FZ, AB, GF	
					CF, DM, CH,	
					GC, FD, FP	£19.95
					AA	
Robot Zap	Gm	Paysoft	5K	C	FP	£5.25
Rugby Game	Gm	Adcom	5K	C	AB	£7.00
Rugby Game	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Seawolf/Bounceout	Gm	Audiogenic		C	AA, HM	£8.99
Simple Simon	Gm	Audiogenic	5K	C	AA, HM	£6.99
Six Program Pack;	Gm	PR Software	3K	C	GV	£7.50
War Game						
Smash Out						
Black Jack						
Logic						
Pick Up Game						
Alarm Clock						
Ski Run	Gm	Rabbit S/W	3K	C	AH	£4.99
Skier	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Skimmetts	Gm	Audiogenic	3K	C	AA	£6.99
Slot Machine	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Soft Toys 1	Gm	Soft Toys	3K	C	IG	£6.50
Soft Toys 2	Gm	Soft Toys	3K	C	IG	£6.50
Soft Toys 2	Gm	Soft Toys	5K	C	IG	£8.00
Space Defence	Gm	Adcom	5K	C	AB	£10.00
Space Defender	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Space Division	Gm	Audiogenic	3K	C	AA	£6.99
Space Invaders	Gm	Hi-Tech	3K	C	CF, AO, FZ	£8.62
Space Storm	Gm	Rabbit S/W	3K	C	AH	£6.99
Space Wars/Battle Zone	Gm	Titan	3K	C	HJ	£6.00
Spiders from Mars	Gm	Audiogenic	5K	R	CH, AA	£24.99

Spiders of Mars	Gm	Anglo American	3K	R	GB	£25.90
Star Battle	Gm	Commodore	3K	R	AA, CH, AB	
					CF, DM, GC	£19.95
Star Wars	Gm	Audiogenic	3K	C	AA	£6.99
Star Wars II	Gm	Titan	3K	C	HJ	£7.00
Stella Shootout	Gm	Adcom	5K	C	AB	£15.00
Stunt Cycle	Gm	Coloursoft	5K	C	FP	£7.75
Sub Attack/Missile Command	Gm	PR Software	3K	C	HN	£7.95
Submarine	Gm	Hi-Tech	3K	C	CF, AO, FZ	£8.62
Super Breakout	Gm	Adcom	5K	C	AB	£7.00
Super Breakout	Gm	Coloursoft	5K	C	FP	£7.75
Super Breakout	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Super Expander High Resolution Pack	Ut	Commodore	3K	R	AA, AB, FZ	£34.95
Super Lander	Gm	Commodore	3K	R	AA, AB, FZ	
					CF, CH, DM	
					FD, FP, GF	£19.95
Super Moonlander	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Super Slot	Gm	Commodore	3K	R	CH, GC, AA	
					DM, AB, FZ	£19.95
					FD, CF	
Super Snake	Gm	Adcom	5K	C	AB	£7.00
Super Snake	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Super Worm	Gm	Rabbit S/W	3K	C	AH	£4.99
The Alien	Gm	Audiogenic	8K	C	CH, AA	£7.99
Treasure Carrying	Gm	Hi-Tech	3K	C	CF, AO	£8.62
UFO Shooting	Gm	Adcom	5K	C	AB	£7.00
UFO Shooting	Gm	Hi-Tech	3K	C	CF, AO	£8.62
VIC Code Monitor	Ut	Commodore	3K	R	FZ	£34.95
VIC Forth	Ut	Datatron	3K	R	Hn	£38.95
VIC Graf	Ut	Datatron	3K	R	Hn	£28.95
VIC Men	Gm	Coloursoft	5K	C	FP	£7.00
VIC Stat	Ut	Datatron	3K	R	Hn	£29.95
VICalc	Ut	Audiogenic	3K	C	AA, HM	£6.99
Vicgammon	Gm	Bug Byte	8K	C	CH	£7.00
Vicmen	Gm	Anglo American	3K	C	GB	£7.00
Vicmen	Gm	Bug Byte	5K	C	CH	£7.99
Vic Cube	Gm	Hi-Tech	3K	C	CF, AO	£8.62
Wall Street	Gm	Audiogenic	3K	C	AA, HM	£6.99

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SOFTWARE SUPPLIERS LIST

Supplier Code	AF	MicroComputerLand Shropshire House 2-10 Capper Street London WC1E 6JR 01 637 4078/948 6411
AA	AG	Comart Ltd St Neots Cambs PE19 3JG (0480) 215005
AB	AH	Cream Computer Shop Rabbit Software 380 Station Road Harrow Middlesex 863 0833
AC	AI	Microvalue Computer Interfacing & Equipment Ltd The Micro Spares Shop 19 Roseburn Terrace Edinburgh EH12 5NG (031) 337 5611
AD	AJ	Molimerx Ltd A J Harding 1 Buckhurst Road Town Hall Square Bexhill-On-Sea East Sussex (0424) 220391/223636
AE		Vincelord Ltd Suite 2 26 Charing Cross Road London WC2 240 0213/0217

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AK GW Computers Ltd 55 Bedford Court Mansions Bedford Avenue London WC1 01 636 8210/631 4818	BC Maplin PO Box 3 Rayleigh Essex 0702 552911/554155	BS Computer Plus 47 Queens Road Watford Herts WD1 2LH 0923 33927	CL MED 1736 Church Hill Road Thurmaston Leicester Leic. 704492
AL Acornsoft Ltd 4a Market Hill Cambridge CB23NJ 0223 316039	BD Caxton Software Publishing Co. 10-14 Bedford Street Covent Garden London WC2 01 379 6502	BT The Essential Software Co. Dept BT (Visconti Ltd) 47 Brunswick Centre London WC1 866 5445	CM Simple Software 15 Havelock Road Brighton Sussex 0273 504879
AM Acorn Computers Fulbourne Road Cherry Hinton Cambridge	BE Cornshall Ltd 32-34 Great Peter Street London SW1	BU Guestel 8-12 New Bridge Street London EC4 583 2255	CN Buffer Micro Shop 374A Streatham High Road London SW16 769 2887
AN Microcomputers Products Int. Rm PCW 8 Cambridge House Cambridge Road Barking Essex IG11 8NT 591 6511	BF Micro Technology Royal Sussex Assembly Rooms The Pantiles Tunbridge Wells Kent 0892 32116	BV Lowe Electronics Chesterfield Road Matlock Derbyshire DE4 5LE 0629 4995	CO Pixel Productions 39 Ripley Gardens London W1 48HF
AO Xitan Systems 23 Cumberland Place Southampton S01 0703 38740	BG Elcon Research Ltd Viking Way Banhill Cambridge CB3 8EZ 0954 81825	BW Gate Micro System Ltd The Nethergate Centre 35 Yeaman Shore Dundee 0382 28194	CP Computics Microsoft 1 Bell Lane Wheatley Oxford OX9 1XY
AP KGB Micros Ltd 14 Winsor Road Slough Berks Slough (0753) 38581/38319	BH Avalon Hill Games 650 High Street North Finchley N12 445 3044	BY Almarc Data Systems Ltd Great Freeman Street Nottingham NG3 1FR 0602 52457/8/9	CQ KW Software 155 Ronginglow Road Sheffield S11 7PS
AQ Broadside 2 The Spinney North Cray Kent	BI Call Apple (UK) c/o SBD Software, Freepost Richmond Surrey 940 5194	BZ Interam Computer Systems Ltd 46 Balham High Road London SW12 675 5325/6/7	CR Sideline Freepost Oxford OX2 8BR
AR Software Ltd 387 8832/388 9927	BJ Lifeboat Associates PO Box 125 London WC2H 9LU 836 9028	CA Terodec Ltd Unit 58 Suttons Park Avenue Earley Reading 0734 664343/6	CS IQ Services Canal House Ardrigshaig Argyll Scotland 0546 3212
AS Lucas Logic Ltd Nasco Microcomputers Division Welton Road Wedgnoek Industrial Estate Warwick CV34 5PZ	BK L & J Computers 192 Honey Pot Lane Queensbury Stanmore Middx HA7 1EE 204 7525	CB Poolsoft 17 Blatchington Road Saford East Sussex 0323 890604	CT Willow Software PO Box 6 Credition Devon EX17 1DL
AT Atlantic Micro System 70-72 Honor Oak Park London SE23 1DY 01 699 2202	BL Peach Tree Software International (Susan Jane) MSA House 99 King Street Maidenhead Berks 0628 71011	CC Highlight Software 3 Nether Court Halstead Essex 0787 475714	CU Level 9 Computing 229 Hughenden Road High Wycombe Bucks
AU TCL Software 59/61 Theobalds Road London WC1 405 5240/2113	BM ACT (Microsoft) Ltd Freepost Birmingham B16 8BR (David Low) 021 454 8585	CD Omega Plus 2c Graham Road London E8 1BZ	CV J Purves 12 Stobhill Road Gorebridge Midlothian EH23 4PL
AV I A S Cambridge Road Orwell Royston Herts 0223 207689	BN Personal Computer Palace 4-6 Castle Street Reading Berks 0734 589249	CE Southern Software PO Box 39 Castleigh Hants SO5 5WQ	CW Cambell Systems Rous Road Buckhurst Hill Essex IG9 6BL
AW Intelligent Artefacts Ltd Cambridge Road Orwell Royston Herts 0223 207689	BO Sinclair Software Sinclair Research Ltd 6 Kings Parade Cambridge CB2 1SN 0276 66104	CF Sigma Systems 54 Park Place Cardiff Cardiff 21515/34869	CX Microdeal Deal House Bridges Bodmin Cornwall
AX Kuma Computers 11 York Road Maidenhead Berks 0628 71778	BP Leicester Computer Centre Ltd 67 Regent Road Leicester LE16YF 0533 556268	CG Planet Software 10 Norton Drive Eaton Norwich	CY Prof. F H George Bureau of Information Science Commerce House High Street Chalfont St Giles Bucks
AY Microstore 327 Kings Road London SW3 352 9291	BQ TABS Ltd Sopers House Chantry Way Andover Hants SP10 12U 0264 58933	CH Brighton Gamer 24 Gloucester Road Brighton Sussex 0273 698424	CZ J Wolstencroft Sagar Fold Preston Chipping (09956) 327
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BA Micro-Spares 19 Roseburn Terrace Edinburgh EH12 5NG 031 337 5611		CJ ACS Software 7 Lidgett Crescent Roundhay Leeds	DB Mick Bignell 01 953 8385
BB CAPS Ltd 28 The Spain Petersfield Hampshire GU32 3LA		CK Chrisalid 13 High Street Berkensstead Herts 74569	DC Giltrole Ltd Dept PCW, PO Box 50 Rugby Warks CV21 4DH
			DD Deep Thought Software 20 Chauntsingers Alton Hants

REFERENCE

SOFTWARE DEALERS

DE Silversoft (Dept PCW) 40 Empress Avenue Ilford Essex	DV Sirtan Computer Systems Unit 14 29 Willow Lane Mitcham Surrey 01 640 6931	EN Davinci Computer Shop 65 High Street Edgware Middx	FE Logic Computers 31 Palmer Street London SW1H 0PR 01 222 1122/5492
DF Michael Orwin 26 Brownlow Road Willesden London NW10	DW Psion Ltd 2 Huntsworth Mews Gloucester Place NW1 6DD	EO Calco Software Lakeside House Kingston Hill Surrey 01 546 7256	FF Overseas Computer Systems Cons. 182a Queens Road Watford Watford 48580
DG Hisoft 60 Hallam Moor Liden Swindon Wiltshire	DX JRS Software 19 Wayside Avenue Worthing Sussex Worthing 65691 (evenings and weekends only)	EP Richard Francis (Dept PCW) 22 Foxhollow Barhill Cambridge	FG Blyth Computers Wenhaston Halesworth Suffolk 050 270 565
DH The Soft Option Bamberplan Ltd PO Box 11 Cranbrook Kent 058080 310	DY Calisto Computers Ltd 119 John Bright Street Birmingham B1 1BE 021 632 6458	EQ Microtek Ltd 15 Lower Brook Street Ipswich Suffolk (0473) 50512 or 52466	FH Taurus Computer Design 47 High Street Baldock Herts SG7 6BG
DJ Microcomputer Spacedrome 3 Westholm London NW11 01 458 5845	DZ Micro Gen (Dept PCI) 24 Agar Crescent Bracknell Berks 0344 27317	ER Diskwise Ltd 25 Fore Street Callington Cornwall 05793 3780	FI HITEC (Austria) Zollergasse 15 A-1070 Vienna Austria 01043 222 934331
DK Spider Software 98 Avondale Road South Croydon Surrey 01 680 0267	EA Anglia Computer Centre 88 St. Benedicts Street Norwich NR2 4AB 0603 26002	ES Control Technology 39 Gloucester Road Gee Cross Hyde Cheshire SK14 5JG 061 368 7558	FJ Graffcom Systems 102 Portland Road Holland Park London W11 01 727 5561
DL Xavier Business Systems 7 North Lane Clayton Scarborough Yorkshire (0723) 583509	EB SBD Software 15 Jocelyn Road Richmond TW9 2TJ 01 948 0461	ET Comp Shop 311 Edgware Road London W2 01 262 0387	FK Electronic Aids (Tewkesbury) Mythe Crest The Mythe Tewkesbury Glos GL20 6EB 0386 831020
DM Camden Electronics (Systems Division) 462 Coventry Road Small Heath Birmingham 021 773 8240/021 772 5718	EC Abacus Software PO Box 7211 Grand Rapids Michigan 49510	EU Micro Computer Prods (Room PC) Cambridge House Cambridge Road Barking Essex IG11 8NT 01 591 6511	FL BUG-BYTE 98-100 The Albany Old Hall Street Liverpool
DN Sumlock Electronic Services Royal London House 198 Deansgate Manchester M3 3NE	ED Qdos Business Software 9 Tintern Close Streethly Birmingham 021 353 0058	EV GW Computers 55 Bedford Court Mansions Bedford Avenue London WC1 01 636 8210	FM Learning Computer Systems 37 St Andrews Drive Seaford Sussex BN25 2SB
DO Microstyle 29 Belvedere Lansdowne Road Bath (0225) 334659	EE dK'tronics 23 Sussex Road Gorleston Great Yarmouth Norfolk (0493) 602453	EW C/WP Computers 108 Rochester Row London SW1P 1JP 01 828 3127	FN Jentech Services Ltd Nordley Bridgnorth Shropshire WV16 4SU 07462 5287
DP Small Systems Engineering Ltd 2-4 Canfield Place London NW6 01 328 7145	EF Computech Systems 168 Finchley Road London NW3 6HP 01 794 0202	EX Metrotech Mail Order Waterloo Road Uxbridge Middx 0895 58111 x 274/269	FO Dept ZM Work Force 140 Wilsden Avenue Luton Beds LU1 5HR
HM Gemini electronics 2-4 Enfield Place London NW6 01-328-7145	EG Electronics Experts Avondale Workshops Woodland Way Kingswood Bristol BS15 1QH	EY Microsystems Ltd Summerfield House Vale Guernsey 0481 47377	FP Twickenham Computer Centre 72 Heath Road Twickenham Middx 892 7896 or 891 1612
DQ Woodland Software 103 Oxford Gardens W10 6NF 01 960 4877	EH Artic Computing 396 James Reckitt Avenue Hull HU8 0JA	EZ Superior Systems Ltd 178 West Street S14ET 0742 755005	FQ Sbd Software 15 Jocelyn Road Richmond 948 0461
DR Telesystems Ltd PO Box 12 Great Missenden Bucks HP16 9DD	EI Knights TV & Computers 108 Rosemount Place Aberdeen 0224 630526	FA Control Universal Ltd Unit 2 Andersons Court Newnham Road Cambridge 0223 358757	FR Beebug PO Box 50 St Albans Herts (Independent User Group for BBC Micro)
DS Macronics 26 Spiers Close Knowle Solihull West Midlands B93 9ES	EJ Microage Electronics 135 Hale Lane Edgware Middx 01 959 7119	FB Pete & Pam Computers 98 Moyser Road London SW16 01 677 2052/7341	FS RAM Computer Services Ltd 15-17 North Parade Bradford 0274 391166
DT Hewson Consultants Dept PCW 7 Graham Close Blewbury Oxon (0235) 850075	EK Holly Products Blackthorn House Dukes Lane Gerrards Cross Bucks	FC Zenith Data Systems Bristol Road Gloucester 0452 29451	FT Ozwise Computers 28 Crofts Road harrow Middx HA1 2PH 01 863 2309
DU Silicon Office Services 240 Durants Road Enfield Middx EN3 7AZ 01 805 0903	EL I O Systems 6 Laleham Avenue Mill Hill London NW7 01 959 0106	FD Commodore Information 675 Ajaz Avenue Slough Berks Slough 79292	FU Compusense PO Box 169 Palmer Green London N13 4HT 01 882 0681
	EM Merton Electronics (Dept PW) 85/87 Station Road W Croydon 680 8606		

FV The Avery Computer Company 13 The Mall Bar Hill Cambridge (Crafts Hill 80991)	GN Collins Computing The Gatehouse Whinburgh Dereham, Norfolk	HF M C Associates 4 Granby Road Cheadle Hulme Cheshire SK8 6LS	HX Abersoft 7 Maes Afallen Bow Street Dyfed SY24 5BA
FW Hilderbey Ltd 8/10 Parkway Regents Park London NW1 01 485 1059	GO Datafax (Dept CT) Riviera House Queens Road Buckhurst Hill Essex	HG Addictive Games Dept YC PO Box 278 Conniburrow Milton Keynes MK14 7NE	HY D.C. Roberts 107a Royal George Rd Burgess Hill Sussex
FX Micromedia Vine Cottage Tentelow Lane Norwood Green Middx 01 843 9457	GP CCSoft 83 Longfield Street Southfields London SW18	HH J K Greye Software Dept YC 16 Park Street Bath Avon BA1 2TE	HZ Hard & Soft 85 Snowden Avenue Hillingdon Middx UB10 0SE 0895-54751
FY Wida Software 2 Nicholas Gardens London W5 5HY 01 567 6941	GQ Microx 52 The Strand Worthing Sussex Worthing 49584	HI John Prince 29 Brook Avenue Levenshire Manchester M19	IA Microdeal Deal House Luxulyan Bodmin Cornwall PL30 5E 0726-850-821
FZ Superior Systems Ltd 178 West Street Sheffield 0742 755005	GR Pro Software 121 Tyn-Y-Twr Baglan Port Talbot West Glamorgan SA12 8YE	HJ Titan Programs 83 Ashwood Road Rudloe Corsham Wiltshire SN13 0LG (0225) 810132	IB Aztec Software 25 St Mark Road Deepcar Sheffield S30 5TS
GA Eltec Services Limited 231 Manningham Lane Bradford BD8 7HH (0274) 491372	GS Sussex Software Wallsend House Pevensey Bay East Sussex	HK Micro Computer Software Unit D6 Pear Industrial Estate Stockport Road Lower Bredbury Stockport SK6 2BP 061 494 2441	IC Ogre Games & Software Fantasy Department 47 Chiselhurst Avenue Liverpool 25 Merseyside
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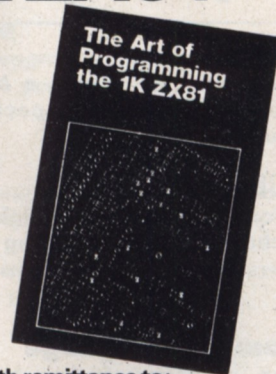
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REFERENCE

MICROTERMS

Get to grips with terminology in this month's issue dictionary. A quick reference guide to common computer jargon.

Address

A label or name (usually a *binary* or *hexadecimal* number) specifying a particular *memory* location.

ASCII

American Standard Code for Information Interchange — representing letters, numbers etc by 128 permutations of a 7-bit code.

Assembly Language

Means of representing *program* statements in mnemonics and conveniently handling *memory* addressing by use of symbolic terms.

BASIC

Beginner's All Purpose Symbolic Instruction Code. An easy to learn, widely used computer language.

Bit

A single *binary* digit, representing either a 'one' or a 'zero'.

Buffer

(1) An area of memory designated to hold data being transferred between devices working at different speeds, eg the fast processor and the slower keyboard, printer or disc.

(2) An electronic device in a signal path designed to allow signals to pass in one direction but to hold back unwanted voltages in the opposite direction, which might damage the sending apparatus.

Bug

An error in *software*.

Byte

A *binary* number, usually of eight *bits*. It can represent a number from 0 to 255 (8-bit byte) as there are 256 possible combinations of "ones" and "zeros" eight bits long.

Cartridge

A self-contained unit which contains either ROM or RAM and plugs into a computer to expand the memory or provide a program.

Character Set

The list of letters, numbers and symbols that you can use to write programs and display information.

CP/M

A standard disc operating system that in theory allows software packages to be run on different machines. It stands for Control Program for Microcomputers.

Cursor

Character or graphic symbol used by the computer to denote where its printing. Also used as a prompt when the computer is expecting you to input information or a command.

Data

Simply, information. The raw material that the computer processes.

Database

An organised collection of information held either in the computer or on disc that can be accessed by the user.

Debug

To correct the errors in a *program*.

Disc

Magnetic storage device allowing fast random access to a large volume of *data*. A full-size hard disc will hold, say, 5 megabytes or more; a smaller floppy disc typically holds from 80 to 250 kilo bytes but in either case the capacity is being increased all the time.

EPROM

Erasable Programmable Read Only Memory. Writing typically takes one minute and erasing, by ultra-violet light, 10 minutes or longer.

Execute

To perform a sequence of *program* steps.

Firmware

Instructions or data permanently stored in ROM.

Flag

A linen object that one salutes — but sailors use them to send messages. So do computers. A flag is an indicator signal (usually just one *bit*) that generally signals a condition.

Graphics

Literally — drawings; a method of producing graphs or pictorial figures on a suitable output device, usually a video monitor (TV set for most hobby computers) but sometimes a chart recorder or printer.

Hard Copy

A computer printout or listing on paper.

Hardware

All the electronic and mechanical components making up a system.

Hex

Shortened version of Hexadecimal, meaning '6 plus 10', which is a funny way of saying 16. It refers to the number system with a base of 16. This uses 0 to 9 and then A to F of the alphabet to represent its 16 digits. Two hex digits can be conveniently used to represent a byte (eight bits).

High Resolution

This means that you can pinpoint one dot on a screen rather than one square giving you graphical pictures of much greater detail and accuracy.

IEEE

Institute of Electronic and Electrical Engineers (in USA) — a body which has set a number of standards for more orderly interchange of information between various electronic devices, including computers.

Instruction

A set of *bits* which causes the CPU to carry out a particular task. Usually a basic or fundamental command understood by the microprocessor.

Interface

A connection between two or more items of equipment along which data and controlling signals are passed.

I/O

Input/Output. A computer generally has one or more *ports* through which it communicates with 'the outside world' — peripheral devices such as a keyboard, video display (VDU), printer etc. An I/O port may be just an output or it can be bidirectional.

Kilo (K)

Normally means 1000, but stands for 1024 (2¹⁰) when referring to memory.

Language

A repertory of commands — symbols, expressions etc, used to 'call up' the instructions or procedures a *processor* can execute. Higher-level languages are easily understood by mere humans and computers designed to work with such languages (BASIC, for example) use an *interpreter* to change this into the *machine code* under which the processor operates.

Location

Physical position; *memory location* is the same as *address*.

Logo

Child oriented computer language with easy to use graphics facilities which is available on the TI99/4A computer.

Loop

Program technique where one section of program (the loop) is performed many times over.

Machine Language (or Code)

The lowest (and tediously detailed) level of program instructions. All higher level coding must be converted to machine language (by compiler or interpreter) before a processor can obey it.

Memory Map

Chart showing how memory is used by a computer. The arrangement of data and program within the memory.

Modulator

A device, included in every good hobby computer, which takes the computer's output and converts it to an RF signal on a suitable TV channel, giving you a cheap, convenient visual display — even if you don't understand what's on the screen!

Monitor

(1) The first level of computer operating systems: the program which turns machine code commands into action, managing input, output etc.
(2) A TV-type device which is specially constructed to handle Video signals from a computer that does not have a modulator.

Non Volatile

Memory which will retain data content after power supply is removed, eg ROM.

Octal

Base 8 number system. Character set is decimal 0-8.

Pascal

A very powerful, structured computer language, available on a variety of microcomputers.

Peek

This command reads a value from a location in the computer memory. It can be used to access either RAM or ROM.

Peripheral

Device attached to a computer, eg printer, plotter, disc unit, but not necessarily essential to its use.

Pixel

The single dot that is used to create characters displayed on the VDU. Also the smallest display unit when using high resolution graphics.

Pointer

In the microprocessor, or in memory external to it, pointers can be registers allocated to listing memory address — they 'point' to memory locations.

Poke

This command places a value in a location of the computer's memory. It can only be used to access RAM or control registers.

Port

Terminal which the CPU uses to communicate with the outside world.

Printer

A device for producing typed or printed copy (hard copy).

Print Out

Same as hardcopy.

Program

A set of instructions, either in mnemonics, in digital (binary) form or in a high-level language, which tells the computer to perform a sequence of tasks.

Program Counter

Register in the microprocessor which keeps track of which part of the program is being executed.

PROM

Programmable Read Only Memory. Proms are a special form of ROM, which can be individually programmed by the user.

RAM

Random Access Memory. Read write memory. Data may be written to or read from any location in this type of memory.

Reset

Simply — go back to the start, do not pass GO, do not collect 200 bytes. A switch whereby computer control is returned to the monitor or low-level operating system and all internal variable values are changed to zero. This may be the only way of getting out of some endless loop which has arisen from a programming error.

Register

A general-purpose memory, or set of memory locations, built into the microprocessor itself. Sometimes, particular registers may be designated for a specific purpose.

ROM

Read Only Memory. Memory device which has its data content established as part of manufacture and cannot be changed.

Routine

A whole program or part of a program designed to perform a single function or action.

RS232

A communications interface used for modems and for serial printers.

Run

Instruction to execute a program.

Serial

Transfer of data one bit at a time.

Software

The different kinds of program required to work a computer.

Source Code

Program written in one of the high-level languages and requiring compilation into machine language before use.

String

A sequence of characters.

Subroutine

A part of a program which performs a specific task and which is available for use elsewhere in a program, as often as you like.

Syntax

The grammar of a programming language.

VDU

Visual Display Unit. Usually a TV set in hobby computers, but may be a video monitor which accepts the output directly from the computer.

Volatile

Memory devices that will lose data content if power supply removed (ie RAM).

Word

Parallel collection of binary digits much as byte.

Z80

Widely used microprocessor. It is used in the ZX81, Spectrum and TRS-80.

6502

A widely used microprocessor. It is the heart of the PET, Apple and Atari computers.

9900

This is a family of Texas Instruments chips. They are used as the processor in the 99/4A machine.



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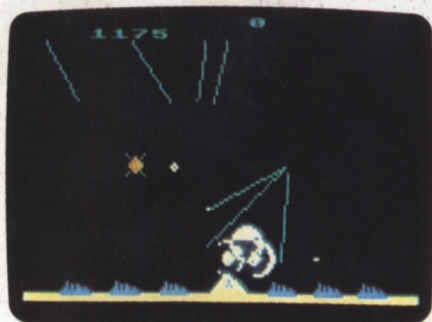
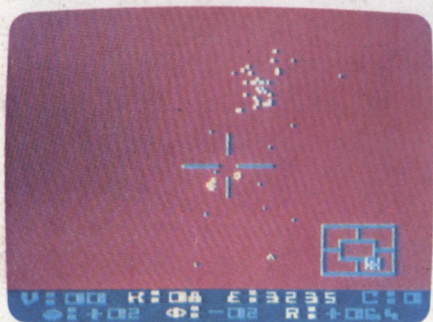
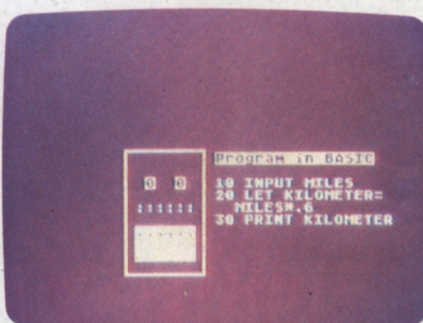
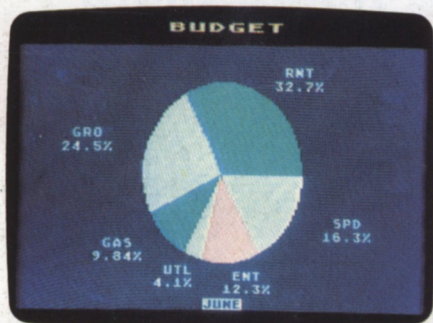
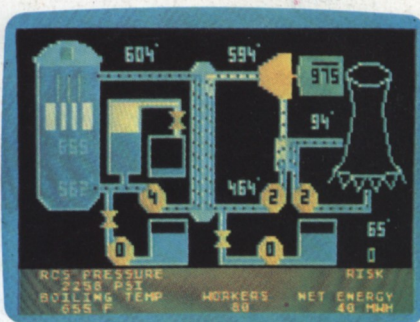
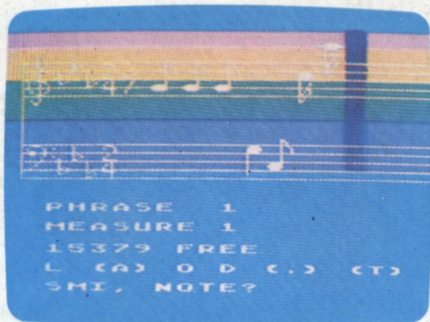
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